PAStimes
Phoenix Astronomical Society
www.pasaz.org
September 2023
Volume 75 Issue 1

# PHOENIX ASTRONOMICAL SOCIETY — ESTABLISHED 1948

## JACQUELINE DO TO SPEAK AT SEPT 7TH MEETING "NATIONWIDE ECLIPSE BALLOONING PROJECT"

PAS sponsors numerous astronomy related events including our monthly lecture series, telescope workshops, star parties, and special events. Details are available on the PAS Event Calendar

All PAS events are free but require registration. Outdoor events are Weather Permitting. Everyone is welcome!

- **September 7** - 7:00pm - Monthly Lecture Series
- **September 21** - 6:30pm - Telescope Workshop 201 – Operating Your Telescope
- **September 21** - 7:30pm - Telescope Workshop 101 – What to Buy
- **September 23** - 6:30pm - Star Party – International Astronomy Day

September 2023 Guest Speaker: Jacquilin Do. Photo provided by Jacquilin.

## PAS RECORDED PROGRAMS

By Terri Finch

Did you miss a PAS Meeting and wish you could see it? You can get to the link of Past Recorded PAS Meetings with Guest Speakers any time by going to pasaz.org and in the left hand navigation bar, click on "Lecture Series Videos." You will then find recordings of Past PAS Meetings for your viewing pleasure. The collection is in newest to oldest order.

As long as PAS can record the PAS Meetings, PAS will continue to add more recordings to this page. Here is the direct link to the recorded PAS Meetings: Lecture Series Videos

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# What's Up For September

| Name | Date | Rise | Set |
|---|---|---|---|
| Mercury | 09-15-23 | 05:06 | 17:50 |
| Venus | 09-15-23 | 03:21 | 16:25 |
| Mars | 09-15-23 | 07:47 | 19:27 |
| **Jupiter** | **09-15-23** | **20:58** | **10:28** |
| **Saturn** | **09-15-23** | **17:40** | **04:42** |
| **Uranus** | **09-15-23** | **21:19** | **11:16** |
| **Neptune** | **09-15-23** | **18:42** | **06:36** |
| **Pluto** | **09-15-23** | **15:56** | **01:53** |

All Times Arizona Time UT-7
Bold means the object is "visible" in the evening.

PAS is incorporated in the state of Arizona as a non-profit, scientific, and educational 501(c)(3) organization. Our newsletter PAStimes is published monthly from September to May and distributed via the Internet. All Issues are available for download on our website www.pasaz.org . Ads. All Photos by Don Boyd unless otherwise credited. All articles and photos are copyright their authors or PAStimes.

# September 15, 2023

**Sunrise: 6:11**
**Sunset: 18:35**

**Q3: September 6**

**New: September 14**

**Q1: September 22**

**Full: September 29**

# Contact Information

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# 2023 PAS Guest Speakers at Hybrid Meetings

By Terri Finch

All PAS Meetings with a Guest Speaker are held at PVCC and can be attended in-person, as well as via Zoom, in a hybrid meeting. Those of you who wish to attend the meeting in person, please meet at PVCC Main Campus. If you wish to attend the meeting via Zoom, that option is available.

All events with PAS are Free to attend but they require registration. Pop on over to the PAS Event Calendar where you can take a moment to register your attendance & you will find everything you need to know about our upcoming events including room numbers & Zoom links.

Do you have an idea for a guest speaker? Email the details and contact info for the possible guest speaker to Paul Facuna at VicePresident@pasaz.org.

Here are the next scheduled guest speakers at PAS:

**Oct 5**: Rhonda Stroud - Topic TBA

**Nov 2**: Kai Staats - Topic TBA

**Dec 7:** Dr. David Williams "Back to the Moon!! An Update on Lunar Exploration"

# The Moon in Three Dimensions

by Matthew B. Ota, PAS Member

Although a lunar eclipse is a rather common astronomical occurrence, and of little scientific value, it does have its attractions for its sheer beauty. As an amateur astronomer, I have learned of the most curious effect I have ever seen in naked-eye astronomy. This phenomenon is seen with regular binocular eye vision.

The full moon appears as a flat disk to the human eye. It has absolutely no limb darkening like Jupiter or other planets. The reason why was not answered until the Apollo moon landings of the 1960s.

The moon's surface is covered with a very fine powder, which is composed of rock that has been pulverized by billions of years of meteoroid impacts. This powdered regolith commonly known as "moon dust" is as fine as talcum powder. It is not smooth in texture and is all angular and faceted on a microscopic level.

This is because there never was any flowing water on the moon to erode and smooth out rocks into rounded curved pebbles. This is an effect that was coined "gardening" by lunar geologists.

Any light that hits a perpendicular flat surface of this powdered regolith is reflected straight back toward the viewer. As a result, no matter what the angle of incidence of the curved face of the moon, light is reflected straight back to your eye in a linear fashion, so equal amounts of photons strike your retina from not only the center of the moon's face but also the edges of the moon's surface at the limb. This is why the moon appears to us as a disk as flat as a pizza pan, with no depth.

However, this effect is nullified during a total lunar eclipse. When a lunar eclipse occurs, the sunlight that reaches the moon is refracted by the Earth's atmosphere, striking it at an irregular and diffuse angle. From the moon's surface, you would be seeing all the earth's sunrises and sunsets at the same time, appearing as a red-orange ring illuminating the atmosphere all around the earth.

The result is the light striking the moon is coming to the moon from a diffuse source and not a solid source of sunlight. The light reflecting to your eyes is red-colored, with the light levels falling off as you look towards the limb or edges of the lunar face. This is the only time that you can see a lunar limb darkening effect.

With this limb darkening in view, and especially when the moon's face is framed by clouds or terrestrial objects like trees or buildings or your fingers and hands, the eclipsed moon magically and spookily appears to you as a three-dimensional sphere hanging in the sky. The light that reaches the moon in this manner is scattered in all directions, and the ruddy moon takes on an eerie three-dimensional appearance. We see it as it truly is, a spherical natural satellite and not a flat pizza plate disc in the sky.

# September 2023 Recent & Future Events


President Stu Brackney

# Stu's Views

By President Stu Brackney

Well, everyone, the hot summer continues but it did not stop PAS from conducting its summer lecture series. We implemented video presentations of various lectures for our members using our ZOOM link, which was well attended. We did have some audio difficulties with one lecture; however, all were well received. You can find a link to our Previously Recorded Meetings on page 2 in this newsletter.

The big event for PAS was its end of year Awards Ceremony on May 18, 2023. Arranged by Terri Finch, this eventinvolved over 100 awards (plaques, pins, certificates and other memorabilia) expressing our appreciation to over twenty members of PAS who go beyond the Kuiper Belt to help PAS. Too many to list here, but the event was well attended, and loud applause went to Terri Finch for all the work she put into this annual event. You should see a few pictures from this event in a future issue of the PAStimes.

By the way, your board has been busy this summer planning future events for you and members of the public. You should share our activities with friends and family, however we want everyone to use the reservation system for all events, so that if it needs to be changed or cancelled, we can automatically inform everyone. Take some time to look at the opening page of www.pasaz.org and click on the link PAS Event Calendar and Registration Site to see the entire year's list of events. And yes, sign up to attend!

# Summer 2023 Lecture Series – Recorded

By Terri Finch

PAS had a very busy summer as mentioned in Stu's Views on page 2 of this newsletter. Here is a quick recap of the Summer Lecture Series. These meetings were recorded and can be found here: https://www.pasaz.org/lecture-series-videos . Enjoy!

On June 1st PAS had "Destination Moon" as presented by Brian Day of NASA.

For the July 6th Summer Lecture Series, we had "The Scientific Magic of Total Solar Eclipses" with Shadia Habbal.

And for the August PAS Meeting through Zoom, we had "Our Magnetic Universe" starring Professor Susan Clark.

I hope you have a chance to watch these recorded presentations at the above link.

And now that September is here and we have our meeting room at PVCC available again, I hope to see you through Zoom or in person at the meetings. Enjoy!

# Astro Photos by PAS Members

By Terri Finch

It's a new PAS year (Sept to May). Show off your Astrophotography in the PAStimes Newsletter. The newsletter deadline is the 10th of each month before the issue is published. Send your photos, and for the captions, please provide the equipment in a list or paragraph about how you took the photo, where, when, and anything else you wish to include. We will do our best to get your photos in the newsletter. We appreciate your beautiful photos and cannot wait to see them. Send them over to Editor@pasaz.org. Thank you!

# Rider Needed for April 8, 2024, Total Solar Eclipse

By Matthew Ota, matthewbkota@gmail.com

I am looking for a PAS Member who would like to ride with me to see the April 8 total solar eclipse. My nephew in Evansville, Indiana has a large house with extra bedrooms downstairs and is offering free lodging. His house is in the path of totality, and with my Prius we can relocate if Evansville is clouded out. We can split gas expenses and the trip takes a little over two days with two stops on the way. If you are interested, email me.

# Grayhawk Elementary School Apr 27

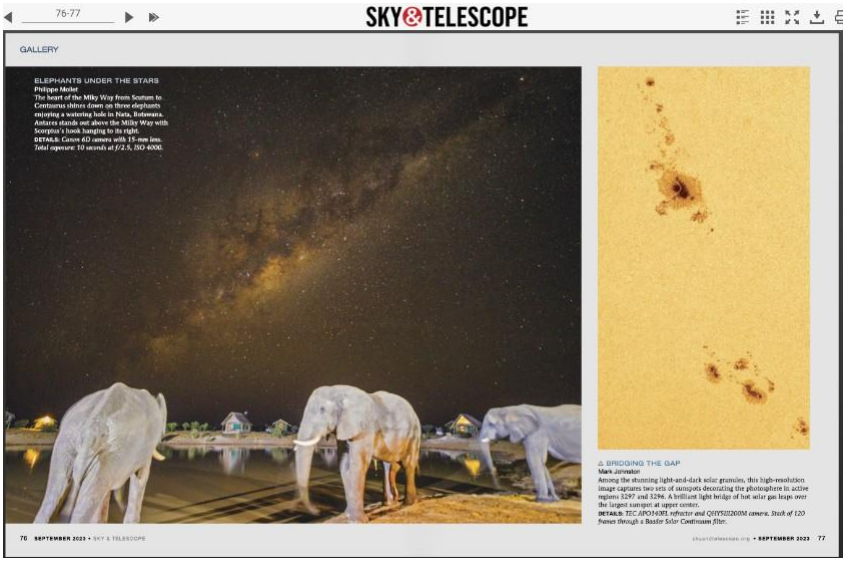
An Educational Outreach Event by Mark Johnston

On April 27 I did a solar event for Grayhawk Elementary School. I explained some basic facts about the Sun, then showed a photo I'd taken an hour earlier and challenged the students to see how much of that detail they could spot when looking in the eyepiece. I explained the anatomy of our star, and I also passed around a meteorite for them to look at while waiting in line. Our future scientists all had a great time! Afterwards, I emailed the STEM teach organizer some photos I'd taken so the kids would have a memento of the event.

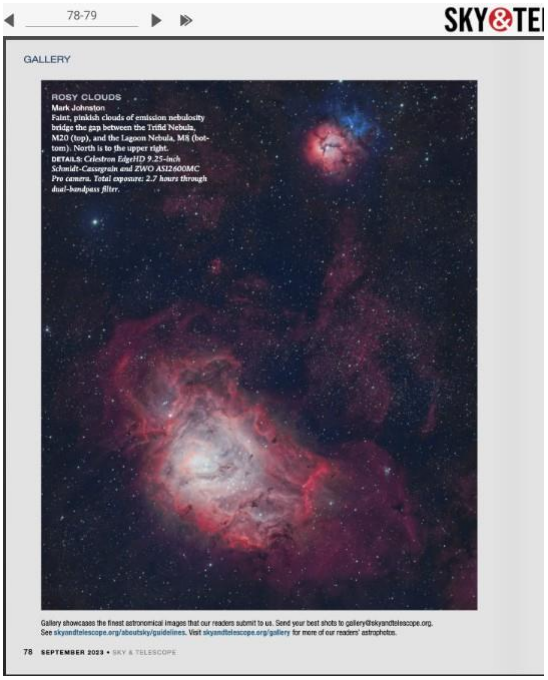
# Mark Johnston, PAS Member in Sky & Telescope!

By Mark Johnston

I got these two of my Astro photos in Sky & Telescope magazine in the September 2023 issue. Enjoy!




Bridging the Gap – A solar surface image by Mark Johnston




Rosey Clouds by Mark Johnston in the September, 2023 Sky & Telescope

# Apache Wash Star Party Apr 15

Notes by Stu Brackney

Your astronomy organization had a star party at Apache Wash Trailhead on Saturday April 15th. We are all in agreement this place has huge potential for us to use it on a regular basis. Parking is fabulous. Travel time is acceptable. Huge sky and most importantly…dark skies. The bad news. Like all of us, before we head out with our telescopes to such an event, we check our list of items to bring. Load up the car, gather some snacks and for this particular location (it does not have potable water) brought some drinks. I drove for only twenty minutes to arrive just as the sun was kissing the horizon. It wasn't long before others arrived with their scopes, some with two! Disaster struck me and my scope. My power source died on me! Every amateur astronomer knows, if you have done this long enough, disaster will strike. Talk about depressing. I packed up my gear and headed home after touring everyone's scopes, chatting, and seeing what they were viewing. Our members have some impressive gear and know how to use it! Lesson learned…if possible, bring spare everything. What I know is …I will be back with my new battery. See you all next time.

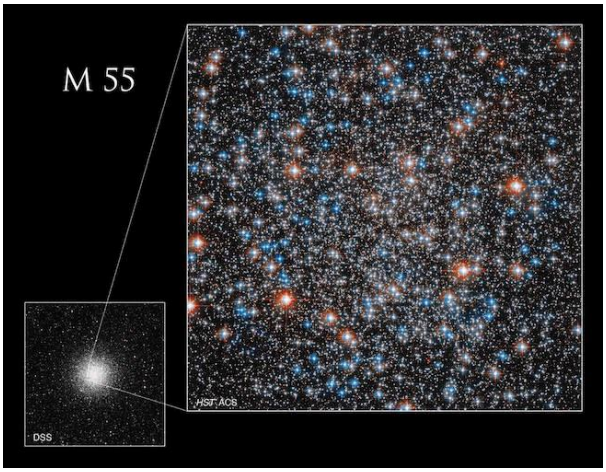
Apache Wash Trailhead Star Party – Photo by Richard Pipkin

By Terri Finch

Yes, this event was scheduled on Tax Day. What better way to enjoy an evening out with the beautiful night sky after working on your tax prep all day?

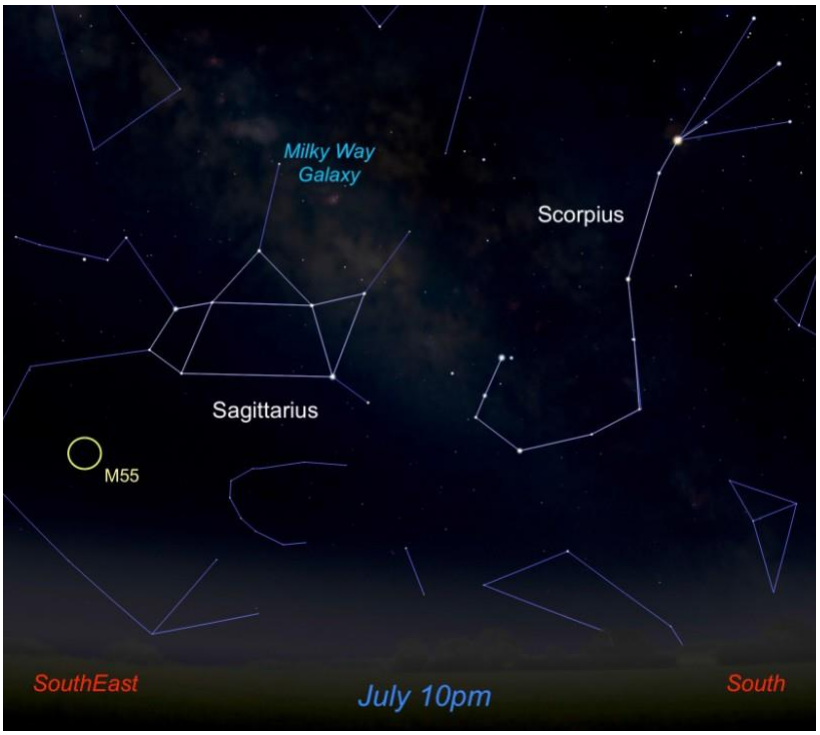
Mike Crawley and his telescope setup at Apache Wash – Photo by Richard Pipkin

# Find A Ball of Stars – M55




By Linda Shore, Ed.D

French astronomer Charles Messier cataloged over 100 fuzzy spots in the night sky in the 18th century while searching for comets – smudges that didn't move past the background stars so couldn't be comets. Too faint to be clearly seen using telescopes of the era, these objects were later identified as nebulas, distant galaxies, and star clusters as optics improved. Messier traveled the world to make his observations, assembling the descriptions and locations of all the objects he found in his Catalog of Nebulae and Star Clusters. Messier's work was critical to astronomers who came after him who relied on his catalog to study these little mysteries in the night sky, and not mistake them for comets. Most easily spotted from the Southern Hemisphere, this "faint fuzzy" was first cataloged by another French astronomer, Nicholas Louis de Lacaille in 1752 from Southern Africa. After searching many years in vain through the atmospheric haze and light pollution of Paris, Charles Messier finally added it to his catalog in July of 1778. Identified as Messier 55 (M55), this large, diffuse object can be hard to distinguish unless it's well above the horizon and viewed far from city lights. But July is a great month for getting your own glimpse of M55 – especially if you live in the southern half of the US (south of 39°N latitude). Also known as the "Summer Rose Star," M55 will reach its highest point in northern hemisphere skies in mid-July. Looking towards the south with a pair of binoculars well after sunset, search for a dim (mag 6.3) cluster of stars below the handle of the "teapot" of the constellation Sagittarius. This loose collection of stars appears about 2/3 as large as the full Moon. A small telescope may resolve the individual stars, but M55 lacks the dense core of stars found in most globular clusters. With binoculars, let your eyes wander the "steam" coming from the teapot-shaped Sagittarius (actually, the plane of the Milky Way Galaxy) to find many more nebulas and clusters. As optics improved, this fuzzy patch was discovered to be a globular cluster of over 100,000 stars that formed more than 12 billion years ago, early in the history of the Universe. Located 20,000 light years from Earth, this ball of ancient stars has a diameter of 100 light years. Recently, NASA released a magnificent image of M55 from the Hubble Space Telescope, revealing just a small portion of the larger cluster. This is an image that Charles Messier could only dream of and would have marveled at! By observing high above the Earth's atmosphere, Hubble reveals stars inside the cluster impossible to resolve from ground-based telescopes. The spectacular colors in this image correspond to the surface temperatures of the stars; red stars being cooler than the white ones; white stars being cooler than the blue ones. These stars help us learn more about the early Universe. Discover even more: https://www.nasa.gov/feature/goddard/2023/hubble-messier-55 The Hubble Space Telescope has captured magnificent images of most of Messier's objects. Explore them all: https://www.nasa.gov/content/goddard/hubble-s-messier-catalog/




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!

# Look Up in the Sky - It's a Bird

By Theresa Summer

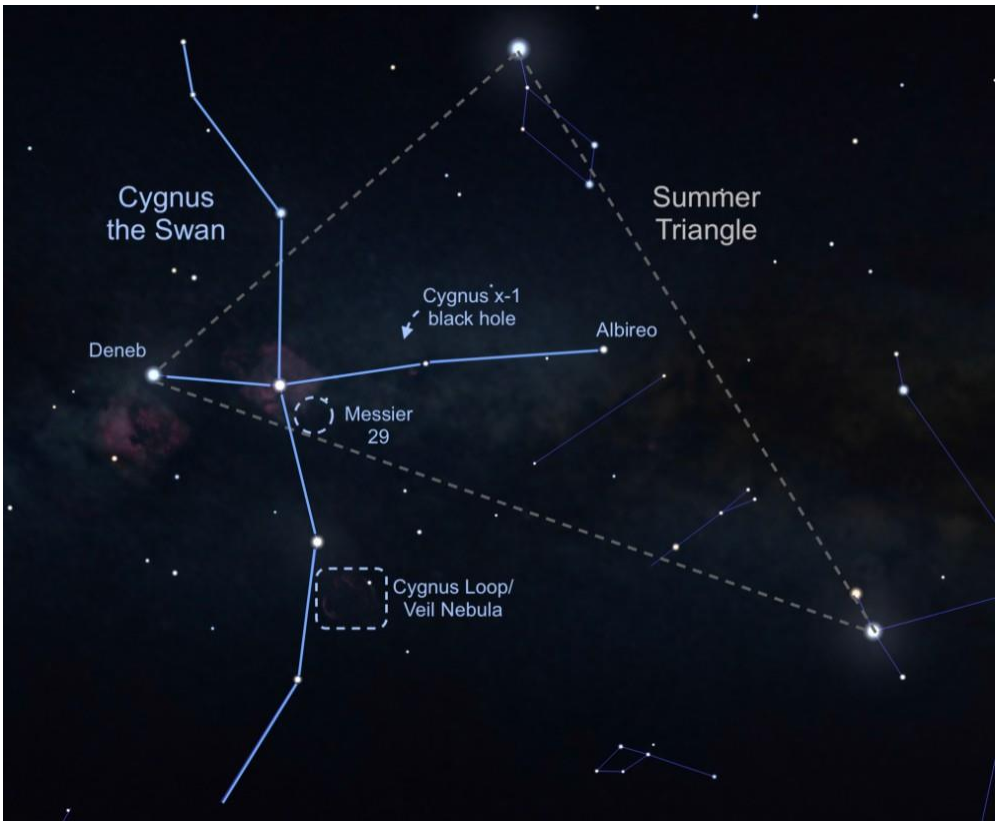
Bird constellations abound in the night sky, including Cygnus, the majestic swan. Easy to find with its dazzling stars, it is one of the few constellations that look like its namesake, and it is full of treasures. Visible in the Northern Hemisphere all summer long, there's so much to see and even some things that can't be seen. To locate Cygnus, start with the brightest star, Deneb, also the northeastern most and dimmest star of the Summer Triangle. The Summer Triangle is made up of three bright stars from three different constellations – read more about it in the September 2022 issue of Night Sky Notes. "Deneb" is an Arabic word meaning the tail. Then travel into the triangle until you see the star Albireo, sometimes called the "beak star" in the center of the summer triangle. Stretching out perpendicular from this line are two stars that mark the crossbar, or the wings, and there are also faint stars that extend the swan's wings.

From light-polluted skies, you may only see the brightest stars, sometimes called the Northern Cross. In a darker sky, the line of stars marking the neck of the swan travels along the band of the Milky Way. A pair of binoculars will resolve many stars along that path, including a sparkling open cluster of stars designated Messier 29, found just south of the swan's torso star. This grouping of young stars may appear to have a reddish hue due to nearby excited gas.

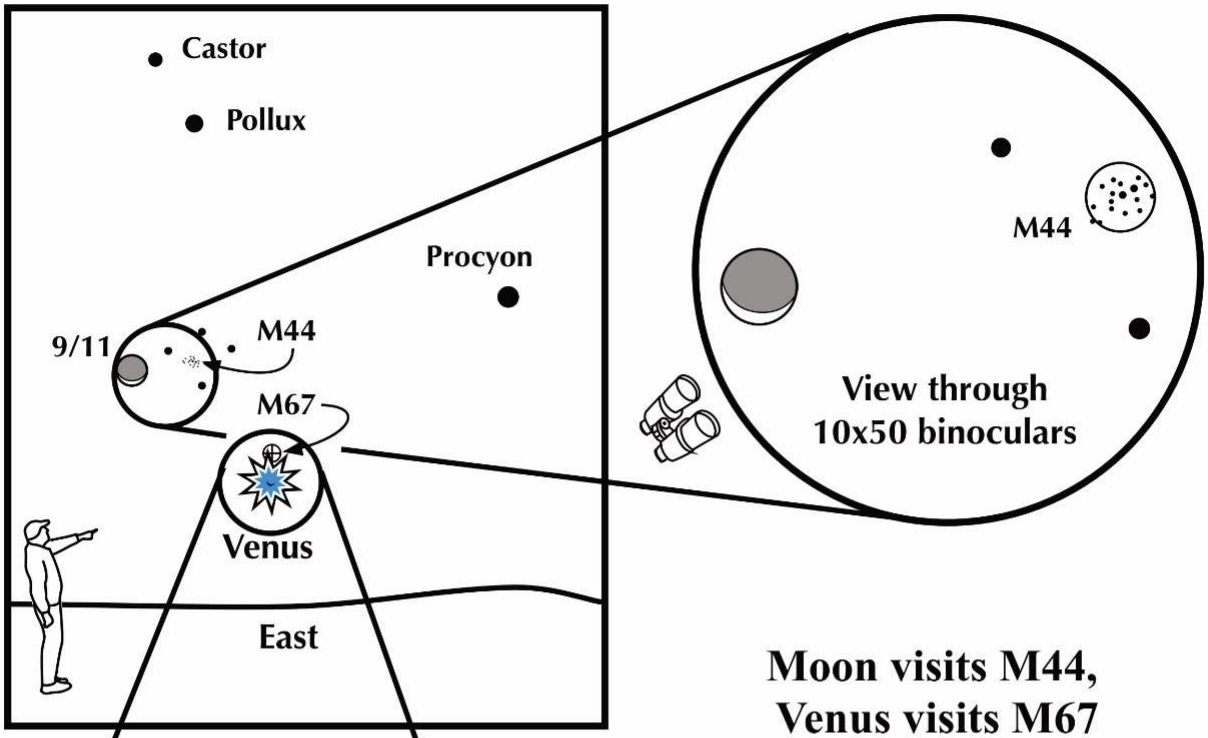
Let's go deeper. While the bright beak star Albireo is easy to pick out, a telescope will let its true beauty shine! Like a jewel box in the sky, magnification shows a beautiful visual double star, with a vivid gold star and a brilliant blue star in the same field of view. There's another marvel to be seen with a telescope or strong binoculars – the Cygnus Loop. Sometimes known as the Veil Nebula, you can find this supernova remnant (the gassy leftovers blown off a large dying star) directly above the final two stars of the swan's eastern wing. It will look like a faint ring of illuminated gas about three degrees across (six times the diameter of the Moon).

Speaking of long-dead stars, astronomers have detected a high-energy X-ray source in Cygnus that we can't see with our eyes or backyard telescopes, but that is detectable by NASA's Chandra X-ray Observatory. Discovered in 1971 during a rocket flight, Cygnus x-1 is the first X-ray source to be widely accepted as a black hole. This black hole is the final stage of a giant star's life, with a mass of about 20 Suns. Cygnus x-1 is spinning at a phenomenal rate – more than 800 times a second – while devouring a nearby star. Astronomically speaking, this black hole is in our neighborhood, 6,070 light years away. But it poses no threat to us, just offers a new way to study the universe.

Check out the beautiful bird in your sky this evening, and you will be delighted to add Cygnus to your go-to summer viewing list. Find out NASA's latest methods for studying black holes at www.nasa.gov/black-holes.



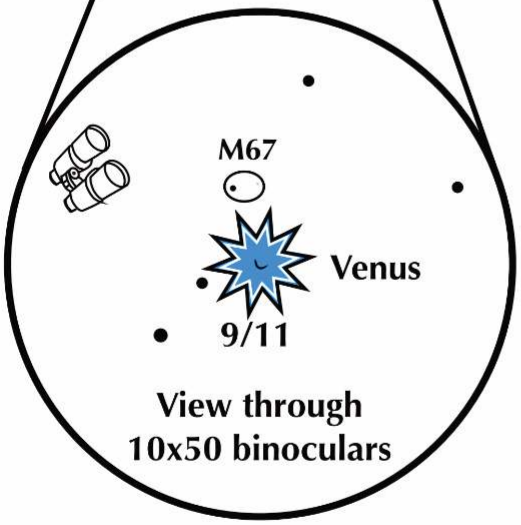

# If you can see only one celestial event in the morning this September, see this one.

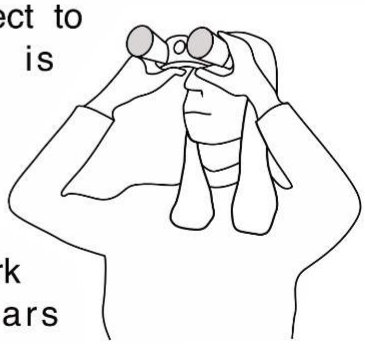



## Moon visits M44, Venus visits M67

On the morning of Sep 11, look to the east 90 minutes before sunrise.

- The crescent moon, full with earthshine, glows left of M44, the Beehive cluster.
- M44 can easily be seen in binoculars.
- The dazzling object to their lower right is Venus.
- Just above Venus lies another star cluster, M67. If viewed from a dark location, binoculars should reveal its fuzzy presence.
- If the binoculars are securely mounted, the tiny crescent of Venus should be barely discerned amid the planet's glare.



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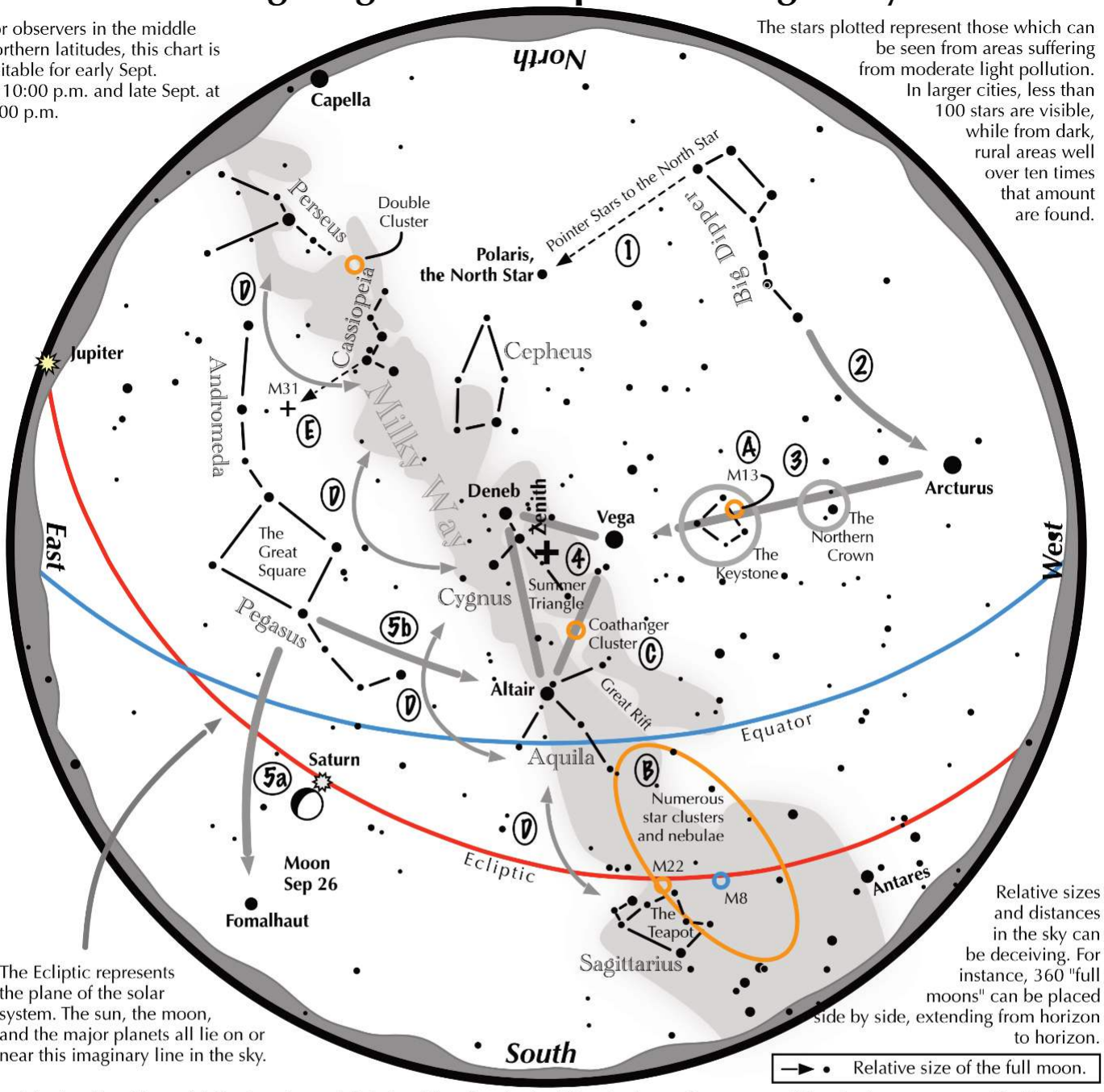
# Navigating the mid September Night Sky

For observers in the middle northern latitudes, this chart is suitable for early Sept. at 10:00 p.m. and late Sept. at 9:00 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.

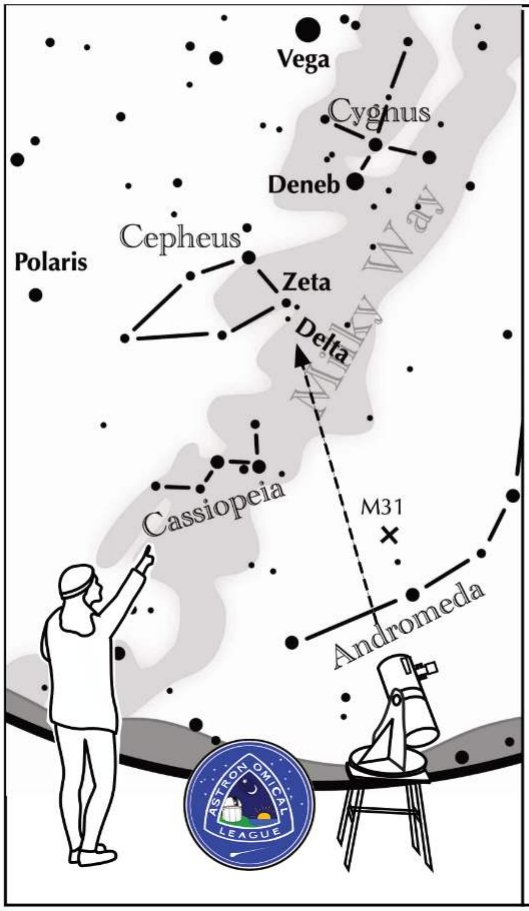
**Navigating the mid September night sky: Simply start with what you know or with what you can easily find.**

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 intersects Arcturus, the brightest star in the September evening sky.
3. Nearly overhead shines a star of similar brightness as Arcturus, 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. The stars of the summer triangle, Vega, Altair, and Deneb, shine overhead.
5. The westernmost two stars of the Great Square, which lies high in the east, point south to Fomalhaut. The southernmost two stars point west to Altair.

**Binocular Highlights**

**A:** On the western side of the Keystone glows the Great Hercules Cluster.
**B:** Between the bright stars Antares and Altair, hides an area containing many star clusters and nebulae.
**C:** 40% of the way between Altair and Vega, twinkles the "Coathanger," a group of stars outlining a coathanger.
**D:** Sweep along the Milky Way for an astounding number of faint glows and dark bays, including the Great Rift.
**E:** The three westernmost stars of Cassiopeia's "W" point south to M31, the Andromeda Galaxy, a "fuzzy" oval.

# ASTRONOMICAL LEAGUE Double Star Activity



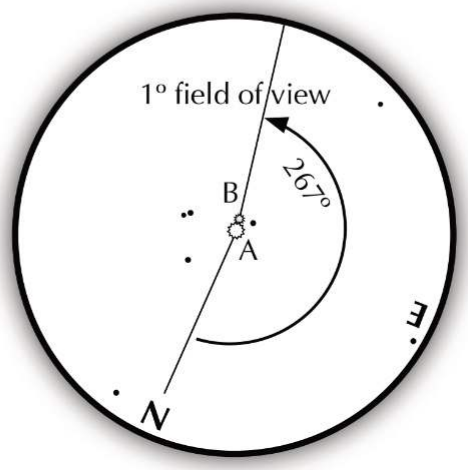

## Other Suns: Delta Cephei

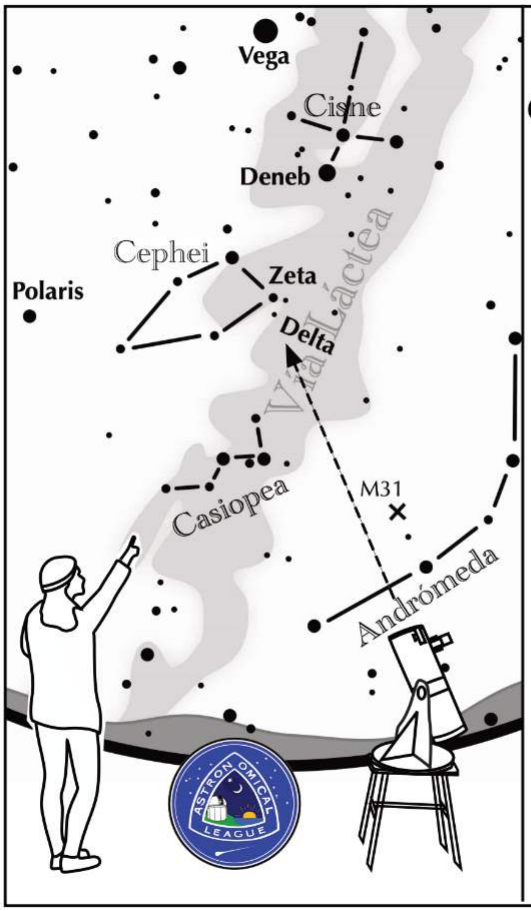
### How to find Delta Cephei on a September evening

Face northeast and find bright Deneb, the northernmost star of Cygnus. It is nearly overhead. Between Deneb and the "W" shaped Cassiopeia lies the house-shaped constellation Cepheus. Find Zeta, the lower left star of the "house." Dimmer Delta shines just below it.

Suggested magnification: >20x
Suggested aperture: >2 inches

**Beta Capricorni**
A-B separation: 41 sec
A magnitude: 4.2
B magnitude: 6.1
Position Angle: 191°
A & B colors:
yellow, blue



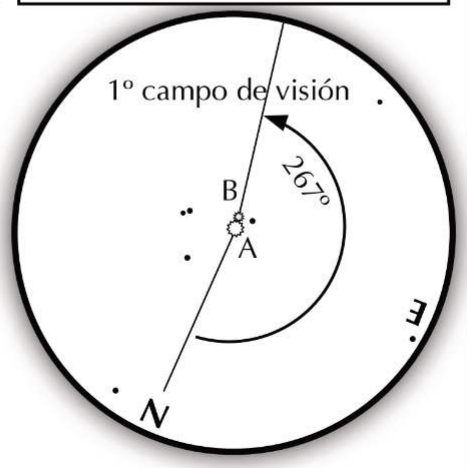

## Otros Soles: Delta Cephei

### Cómo encontrar Delta Cephei en una tarde de Septiembre

Mire hacia el noreste y encuentre a la brillante Deneb, la estrella más al norte de Cisne. Está casi arriba. Entre Deneb y Casiopea en forma de "W" se encuentra la constelación de Cefeo en forma de casa. Encuentra a Zeta, la estrella inferior izquierda de la "casa". La Delta con brillo debil, esta justo debajo de ella.

Ampliación sugerida: >20x,
Apertura sugerida: >50 mm

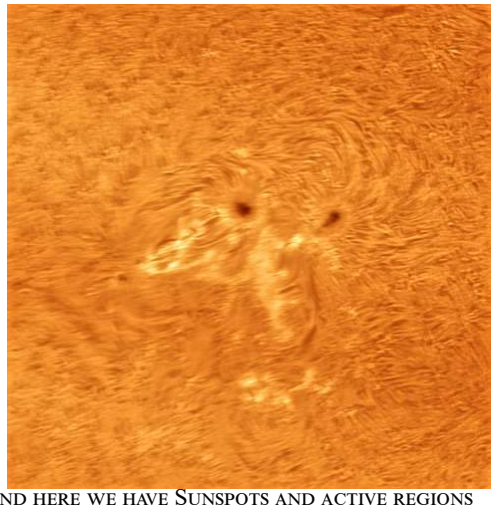
**Delta Cephei**
A-B separación: 41 sec
A magnitud: 4.2
B magnitud: 6.1
PA: 191°
A & B color:
amarilla, azul



(Continued from page 4)

# Grayhawk Elementary School

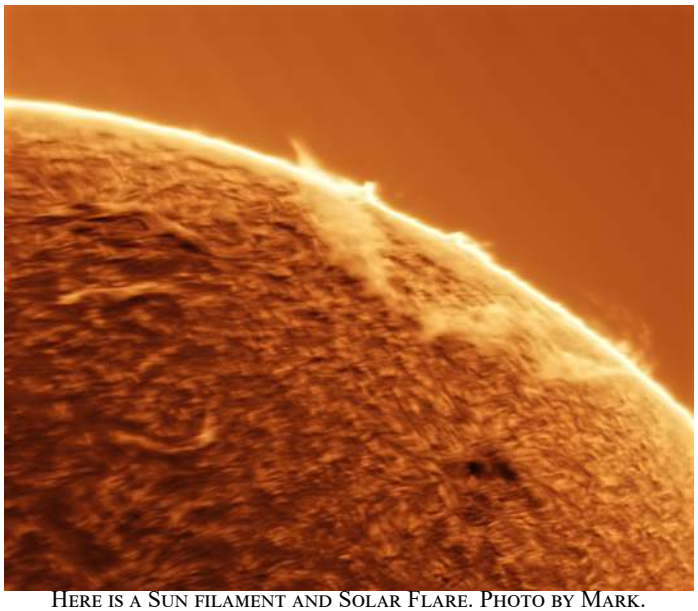
An image of a very active Sun. These photos by Mark Johnston, PAS Member doing Public Outreach at Greyhawk School on Apr 27, 2023.



And here we have Sunspots and active regions on the surface of the Sun. Photo by Mark.

Q & A is always fun with Mark. Photo provided by Mark.

A teacher monitors the safety of the students as they look through Mark's Solar Telescope.



Here is a Sun filament and Solar Flare. Photo by Mark.