

December 2025

Monthly Newsletter



PAStimes

A Publication of the Phoenix Astronomical Society

In this newsletter
you can expect:

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The President](#)

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Party Report /
Sunspot AR 4274](#)

[Sam Insana
Student
Scholarship](#)

[247th AAS
Meeting](#)

[Navigating The
December Night
Sky](#)

[Double Cluster](#)

[Member Images ,
Book Review and
much more](#)

Carla Meeske

MILKYNIGHT.COM

CARLA MEESKE



**EVENT
REMINDER**

4 – Monthly Lecture Series: World of Fire with Dr. Williams

| 10-Lecture: APOD Turns 30: Best Space Images Ever from NASA's Astronomy Picture of the Day

| 18 – Telescope Workshop

| 13 – Book Club | 22 – ASIG Meeting | 27-Public Star Party



Wintertime has arrived in our Valley of the Sun with lots of rain and clouds. Some of you recently experienced huge hailstorms. But winter does not officially arrive until December 21 this year. That is our winter solstice. It's the day with the fewest hours of sunlight throughout the year, making it the "shortest day" of the year in the Northern Hemisphere.

Membership renewals- Great news everyone; your board recently modified the membership renewal process. As usual, most of you have annual memberships due for renewal in January 2026. We will be sending you reminders to assist you with the easy online process, so keep an eye out for detailed explanations.

As you read this edition of the PAsTimes, you will see your organization continues to reach out to not only its members with various events, but also the greater Phoenix community. Your Star Tours program is busy with school events, local museums, and of course various business events. Some of our member events could use a volunteer or two. Interested in helping? Contact me so I can put you on my "Volunteers List".

Mark Johnston, our Vice President is tasked with finding speakers for our monthly lecture series at PVCC. Do you have a suggested speaker he could contact? If so, let Mark know: vicepresident@pasaz.org

I am still looking for someone to help with our organization's history file. Is that you?

Your leadership team reminded me to remind you that we thank you for your continued support of PAS and that we send you our best wishes for a fabulous holiday season. And that all of you find what you are looking for when you look up to our dark Arizona skies. Happy holidays everyone.

Stuart Bradney



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DECEMBER 2025 UPCOMING EVENTS



4/
THUR

MONTHLY LECTURE SERIES

World of Fire with Dr. Williams



27/
SAT

PUBLIC STAR PARTY

Our Star Parties are held at one of our public star party sites which have an excellent view of the night sky. Parties begin before sunset so equipment setup may be completed in the daylight.



10/
WEDNESDAY

LECTURE: APOD TURNS 30

The Best Space Images Ever from NASA's Astronomy Picture of the Day-Dr. Robert J. Nemiroff, Professor of Physics at Michigan Technological University
Co-founder of NASA's Astronomy Picture of the Day (APOD)



18/
THUR

TELESCOPE WORKSHOP

101/201

101 What to buy
201 How to operate your telescope.



22/
MON

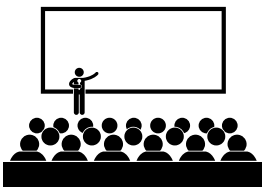
ASIG/ASTROIMAGING -

MEMBERS ONLY

Are you passionate about capturing the beauty of the cosmos? Whether you're a beginner or an experienced astrophotographer, now is the perfect time to join

**MORE
INFORMATION**

For more information and to register for these events, go to the [PAS Event Calendar and Registration Site](#). It is important to register for all events. In case of an event change or cancellation, you will be notified via email.



December Lecture

Dr. Williams



Topic: World of Fire: New Insights into Jupiter's Volcanic Moon Io from NASA's Juno mission.

Summary: Io is the most volcanically active world in the Solar System. Tidal flexing induced by a Laplace orbital resonance with Europa and Ganymede melts Io's interior to power over 400 volcanoes. NASA's Juno Jupiter polar orbiter mission conducted close flybys of Io in 2023 and 2024 – what has been learned? Join Professor David Williams of ASU's School of Earth and Space Exploration for an update on exploration of one of the most active worlds in the Solar System.

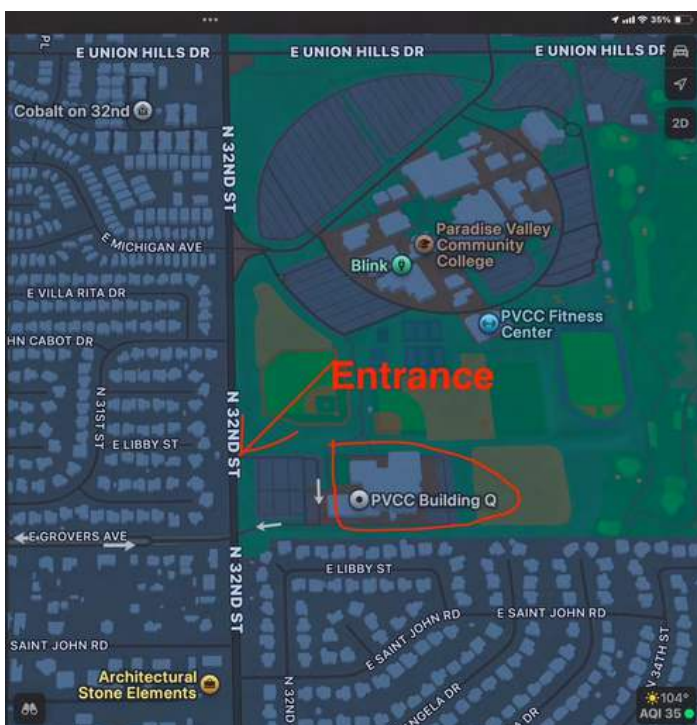
Bio: ASU Professor David Williams began his professional career as a postdoc on the NASA Galileo mission, studying Jupiter's moons Io and Europa. Now a new era begins with the launch of NASA's Europa Clipper in October 2024.

His research primarily focuses on volcanology and planetary geology, emphasizing planetary mapping, geochemical, and remote sensing studies. He has been involved in geologic mapping of various celestial bodies in the Solar System, including Jupiter's satellites, Mars, Titan, Pluto, the asteroid Vesta, and the dwarf planet Ceres. Dr. Williams has participated in several NASA missions, such as the Magellan Mission to Venus, Galileo Mission to Jupiter, and Dawn Mission to asteroid Vesta and dwarf planet Ceres. Additionally, he is a Co-Investigator on the European Space Agency's Mars Express orbiter mission and serves as the Deputy Lead for the Psyche Multispectral Imager for NASA's Psyche Mission. Dr. Williams has contributed extensively to planetary science through his research publications and leadership roles in various NASA projects

ATTENTION

NEW LOCATION

All of our PAS events at Paradise Valley Community College are now being held in **Building Q room 120A**. This is the former Maricopa County Library building south of the PVCC athletic fields on 32nd street.



Here's a recap of last month's Meeting

Laura-May Abron

Exoplanets: Exploring Thousands of New Worlds Beyond Our Solar System



This month's talk delivered a wide-ranging and engaging look at the rapidly evolving science of exoplanets—planets orbiting stars beyond our Sun. Beginning with the first confirmed detections in the early 1990s, the field has exploded to more than 6,000 confirmed exoplanets and over 15,000 candidates. The speaker walked us through how these planets are discovered, the incredible diversity of worlds now known, and what the next generation of space telescopes may reveal.

A major portion of the presentation explored the techniques used to detect exoplanets, including transit photometry (measuring subtle dips in starlight as a planet passes in front of its star) and radial velocity (detecting the tiny wobble of stars caused by orbiting planets). Together, these account for most discoveries, while microlensing, direct imaging, and timing-based methods fill in the rest. Each approach provides different clues—helping astronomers determine a planet's size, mass, orbit, and sometimes even its atmospheric composition.

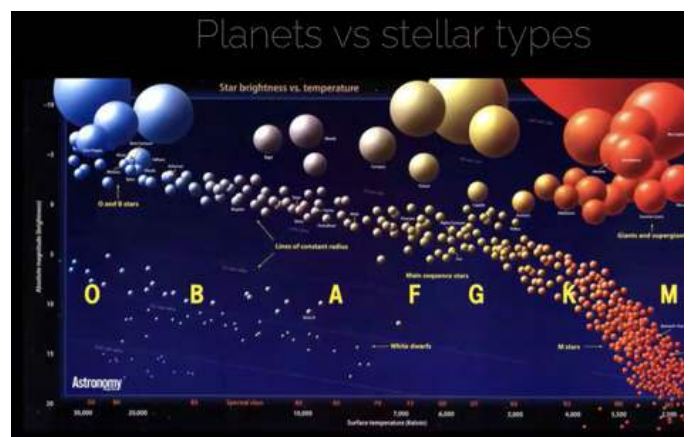
The talk highlighted the extraordinary variety of exoplanets found so far. Many fall into categories that don't exist in our own solar system, such as super Earths (rocky planets larger than ours), mini Neptunes, and water-rich worlds with deep global oceans. Meanwhile, large hot Jupiters, orbiting dangerously close to their stars, dominated early discoveries because they are easier to detect. The way these worlds form and migrate has challenged traditional theories of how planetary systems evolve.

We also learned that exoplanets orbit an astonishing range of stars—from cool red dwarfs to sun-like stars and even exotic objects like pulsars. Some systems are especially complex, including multi-planet arrangements such as Kepler-90 with eight planets, and TRAPPIST-1 with seven Earth-sized worlds, three of them in the habitable zone. The presentation also explored planets in binary and quadruple star systems, as well as exotic orbital configurations like circumbinary planets, which orbit two stars at once.

Although exoplanets are now common discoveries, exomoons remain elusive. Their signals are faint and difficult to distinguish from other effects, though several promising detection methods are being refined—including the search for the ionized gas clouds that volcanically active moons could produce.

The ultimate goal, of course, is finding a true Earth analog—a planet that matches Earth in size, composition, and distance from its star. The talk emphasized that being in the “habitable zone” doesn't guarantee life, especially around flare-prone red dwarfs, but atmospheric studies are becoming more sophisticated. The James Webb Space Telescope is already capturing detailed atmospheric spectra of distant planets, while the upcoming Nancy Grace Roman Space Telescope promises to dramatically expand our ability to detect new worlds—if it avoids cuts and stays on schedule.

The speaker concluded with a personal perspective on how quickly the field has evolved. In just a few decades, exoplanet science has transitioned from speculation to a thriving research frontier. With new discoveries occurring almost daily, the search for other worlds—and possibly life—continues to accelerate.





247TH MEETING OF THE AMERICAN ASTRONOMICAL SOCIETY
PHOENIX, ARIZONA **4-8 JANUARY 2026**

The Super Bowl of Astronomical Sciences

Now Open to Amateur Astronomers

More than 3,600 attended last year's winter AAS meeting. Space is limited, so don't miss your chance to attend North America's largest astronomical sciences event under the dark skies in Phoenix!

AAS Affiliate Members Save Over 80% on Registration Fees.

See below how *S&T* subscribers and astronomy club members qualify to become AAS Affiliate Members

The Largest Gathering of Astronomers in North America

This is your gateway to four incredible days filled with cutting-edge astronomical science, dynamic presentations, breakout sessions, press conferences showcasing the latest discoveries, and a bustling exhibit hall — past exhibitors include NASA, NSF, SETI, NOIRLab, STScI, and equipment manufacturers including PlaneWave, Observable Space, Diffraction Limited, FLI, Unistellar, and Stellarvue.

Save over 80% on your registration as an AAS Affiliate Member

As a *Sky & Telescope* subscriber or an astronomy club member, you have an exclusive opportunity to join the American Astronomical Society as an Affiliate Member and unlock discounted registration to the 247th AAS meeting in Phoenix. Affiliate Members also receive discounts on American Institute of Physics (AIP) publications, special rates on the Annual Review of Astronomy and Astrophysics, plus other great benefits.

AAS 247 Phoenix, Arizona, 4-8 January 2026 — Come for the Meeting, Stay for the Vacation

HELPFUL LINKS

To register for AAS 247

To join AAS as an Affiliate Member

Register for AAS 247 as an Affiliate Member





<https://aas.org/meetings/aas247/registration>

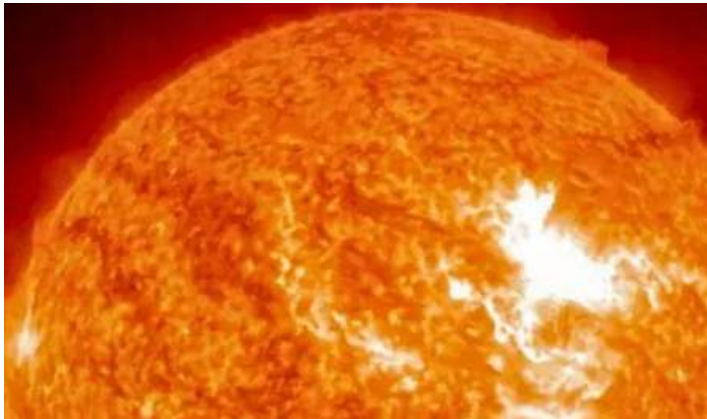
Why Attend?

- The largest astronomical event worldwide
- 4 days, over 80 sessions featuring the latest astronomical discoveries, press conferences, and plenary sessions presented by the rock stars of astronomy, planetary science, solar science, historical astronomy, etc.
- 3,600+ professional astronomers
- Universities, Planetariums, Museums, Private/Public Observatories, Private / Public Research Centers, companies involved in the space industry, federal agencies including NASA, NSF, plus more.
- 500+ amateur astronomers
- We are partnering with astronomy clubs and organizations like yours, providing amateurs discounted access to the entire 4-day meeting and exhibit hall.
- 80+ Exhibitors
- Featuring the latest and greatest astronomical equipment including the Sky & Telescope Pavilion featuring: Celestron, PlaneWave, QHYCCD, FLI, ZWO, Stellarvue, Sky-Watcher and many more!

In the NEWS

Sun Unleashes Strongest Solar Flare of 2025

On November 11, the Sun erupted with its strongest solar flare of 2025, an energetic X5.1-class burst from sunspot AR4274 that temporarily disrupted radio communications across parts of Africa and Europe. The event also launched a rapidly moving coronal mass ejection (CME) toward Earth, which may merge with two earlier CMEs from the same region to create a powerful “cannibal CME.” If that happens, forecasters expect the potential for a strong geomagnetic storm, raising the likelihood of vivid auroras across northern regions in the coming nights. This flare is the latest in a series of eruptions from AR4274, underscoring just how active Solar Cycle 25 remains and how solar weather can affect aviation, communications, and power systems here on Earth.



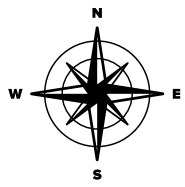
(Credit: NASA Space News — <https://nasaspacenews.com/2025/11/strongest-solar-flare-of-2025/>)

Is the Expansion of the Universe Slowing Down?

New research suggests the universe’s expansion may actually be slowing down, challenging decades of belief that it is accelerating due to dark energy. Scientists re-examined measurements of Type Ia supernovae, the “standard candles” used to track cosmic distances, and discovered a bias linked to the age of their host stars. After correcting for this effect, the data no longer fits the standard Λ CDM model of constant dark energy; instead, it indicates that dark energy may be weakening over time, and the universe may have already entered a period of deceleration. This breakthrough also helps address the long-standing Hubble tension, the discrepancy between different methods of measuring the expansion rate. Future observations, including those from the Vera Rubin Observatory, will be critical in testing this provocative idea and reshaping our understanding of cosmic evolution. (Credit: NASA Space News — “Is the Universe Slowing Down? New Evidence Suggests Deceleration”) (nasaspacenews.com)



(Credit: NASA Space News — “Is the Universe Slowing Down?” — <https://nasaspacenews.com/2025/11/is-the-universe-slowing-down/>)



Summary of Outreach Events

Star Tours & Outreach events

11/2/2025 Party @ Apache Wash

11/3/2025 McDonald's Ranch

11/6/2025 Sanctuary

11/14/2025 Boy Scouts



PHOTO BY STU BRACKNEY-SEESTARS



PHOTO BY STU BRACKNEY



StarTours by Andrew Stone

Object Name	Object Type	Constellation	Visual Magnitude	Apparent Size	Rise Time	Set Time
Saturn 🪐	Planet	Aquarius	0.6	18" (disk)	2:15 PM	2:00 AM
Uranus	Planet	Taurus	5.7	2.3" (disk)	5:15 PM	7:00 AM
Neptune	Planet	Pisces	7.8	4" (disk)	2:25 PM	2:15 AM
Jupiter	Planet	Gemini	-2.7	45" (disk)	9:00 PM	11:00 AM
Mercury	Planet	Ophiuchus	-0.75	7" (disk)	5:45 AM	4:45 PM
M1 Crab Nebula	Supernova Remnant	Taurus	8.4	6' x 4'	7:30 PM	7:30 AM
M2	Globular Cluster	Aquarius	6.5	16'	10:30 AM	10:30 PM
M42 (Orion Nebula)	Emission Nebula	Orion	4	60' x 60'	7:00 PM	7:00 PM
M27 (Dumbbell Nebula)	Planetary Nebula	Vulpecula	7.5	8'	3:00 PM	1:00 AM
M57 (Ring Nebula)	Planetary Nebula	Lyra	8.8	1.4'	5:00 PM	3:00 AM
NGC 2392 Eskimo Nebula	Planetary Nebula	Gemini	9.2	0.8'	10:30 PM	10:30 AM
NGC 6826 Blinking	Planetary Nebula	Cygnus	8.8	2.1'	5:00 AM	12:30 PM
NGC 7662 Blue Snowball	Planetary Nebula	Andromedae	8.3	0.5'	10:00 AM	3:00 AM
M31 (Andromeda Galaxy)	Spiral Galaxy	Andromeda	3.4	180' x 60'	11:00 AM	1:00 AM
M33 (Triangulum Galaxy)	Spiral Galaxy	Triangulum	5.7	70' x 40'	1:00 PM	4:00 AM
M81 & M82 Bode's Galaxy	Galaxy	Ursa Major	6.9 & 8.4	21' x 10' & 11' x 4'	12:30 AM	2:30 PM
Double Cluster (NGC 869/884)	Open Cluster	Perseus	4.3 & 4.4	30'	5:00 PM	5:00 AM
M35	Open Cluster	Gemini	5.3	28'	8:00 PM	8:00 AM
M36	Open Cluster	Auriga	6	12'	7:30 PM	7:30 AM
M37	Open Cluster	Auriga	5.6	24'	7:30 PM	7:30 AM
M38	Open Cluster	Auriga	6.4	21'	7:30 PM	7:30 AM
M44 Beehive Cluster	Open Cluster	Cancer	3.1	95'	10:30 PM	10:30 AM
M45: Pleiades	Open Cluster	Taurus	1.6	1.5°	1:30 PM	1:30 AM
NGC 457: Owl Cluster	Open Cluster	Cassiopeia	6.4	13'	5:30 PM	5:30 AM
Albireo	Double Star	Cygnus	3.1 / 5.1	35"	7:00 AM	10:00 PM
Epsilon Lyrae Double-Double	Double Star	Lyra	4.7 / 4.7	3.5'	5:00 AM	10:00 PM
Achird Eta Cassiopeiae	Double Star	Cassiopeia	3.5 / 7.5	12'	N/A	N/A

Sam Insana PAS Student Scholarship

Sam Insana PAS Student Scholarship

Winners:

- Jacinda Lopez
- Cody Creech

A huge “Congratulations” to both of you!

Your hard work, passion, and dedication have truly shined, and we’re thrilled to recognize your achievements with this year’s Sam Insana PAS Student Scholarship. Keep reaching for the stars—this is just the beginning of an amazing journey!

All Arizona Star Party Report

By Michael Cawley

The light pollution around the Phoenix area keeps getting worse. Some of my nearby observing spots on the outskirts of town no longer provide my needed fix of deep sky observing. Even facing in the general direction away from the city doesn't help much. Moon, Jupiter, Saturn, and some bright open clusters (Pleiades) still look pretty good, but there is a lot more lurking up there!

Twice a year a couple of clubs host a star party out at a site west of Phoenix north of Interstate 10. Called the Hovatter North Observing Site, named after the access road exit from the freeway, this site offers a large open desert area with enough room to handle about 100 visitors and their rigs. A refreshment tent occupied a central area stocked with potluck goodies and hot coffee was provided later in the evening. When Mother Nature calls there are 2 Porta Potties on site!

Making my way out on Friday afternoon was relatively painless and I arrived around 4:30 PM to see about 30 rigs and various camping setups scattered about the grounds. Not bad for a weekday (the main event was Saturday). After picking out a spot and setting up my gear I settled back to watch a beautiful clear sunset. I warmed up for the night's activities by spending some time gazing at a setting Moon and waiting for some stars to pop into view for scope alignment. I spent the time listening to the chatter coming from the various campers discussing alignment setups, filters being used, camera settings, hoping their tablet or laptop will cooperate, talking about their new pride and joy eyepiece fresh from the box, or joking about they're not getting any younger!

After astronomical twilight I started looking for the early highlight of the evening, comets! Both comets C/2025 A6 (Lemmon) and C/2025 R2 (SWAN) did NOT disappoint. SWAN looked better in my telescope, having a short tail and looking like a diffused bright ball among the background stars. Lemmon was a real showoff. Sporting a tail that was about 3 degrees in length (about 6 full moons) it required a binocular view to take it all in. Sprinkled in around the tail were various stars poking thru. Wonderful! I spent about 20 minutes looking at it.



After that show I worked on my observing list based on the months of the year when various targets are at their best. Dark skies really help in catching faint galaxies and nebula. Some objects still remained invisible despite the dark skies and clear weather. But, technology to the rescue! When they started to serve coffee at the tent a fellow observer was offering views thru his filter-equipped Gen 3 night vision monocular. Sheesh, gazing thru that felt like cheating. Looking around at the sky with it, out popped the California Nebula, Heart and Soul, Flaming Star, North American, and the Helix. Night vision isn't cheap but the views they give make it really tempting.

The Milky Way was arching high overhead so I spent some time cruising thru the starfield with a low power view thru my binoculars. Some of the usual Messier suspects were close enough to enjoy together with the binos. M42 was beautiful along with The Running Man nearby. Around 3:30 or so I made my way over to Leo, now high enough out for the muck to see more galaxies. Another hour was spent enjoying the NGC and Messier targets under the belly. Sometimes one or two NGC wisps would sneak into the view of a bright Messier galaxy.

All too soon I could see the growing dawn glow intruding into the sky. I wrapped up my night by spending some time with Venus as it rose up ahead of the Sun.

If you have never ventured out to some of the dark sky sites around the Valley I urge you to take advantage of them when you get the time. PAS offers a trip to the Wupatki National Monument that looks like an excellent spot for some memorable views. I'll be sure to travel there on the next trip and back out to Hovatter in March for the Messier Marathon!



Be sure to pick up a copy and dive into his fascinating article on the evolution of solar imaging. It's a brilliant walkthrough of how far our tools, techniques, and understanding have come—definitely worth the read!

THE EVOLUTION OF SOLAR

After four centuries of advances, astronomers now capture the Sun's swirling, dynamic features in stunning detail.

STORY AND IMAGES BY MARK JOHNSTON

THE SUN HAS CAPTIVATED humanity for millennia. And yet, despite being our closest star, studying it is not easy. Its blinding brilliance long defied detailed study. But over the centuries, astronomers have developed ingenious tools to unveil its secrets.

From crude sketches of sunspots to today's stunning images, the journey of solar imaging reflects both human curiosity and technological ingenuity. Each advance has deepened our understanding of how dynamic our star is — and how it impacts life on Earth.

Sunspots are active regions where the Sun's magnetic field contorts itself into loops and arcs. Solar imaging captures these phenomena, providing both dramatic imagery and scientific insight.

EARLY VISUAL OBSERVATIONS

The earliest solar observations relied on the naked eye. Chinese astronomers recorded sunspots as early as 364 B.C.E., noting dark blemishes visible during sunset or through haze. (Note: Never try to observe the Sun without proper solar filters or equipment.) It wasn't until the early 17th century, with the advent of telescopes, that systematic study began.

Among the first solar astronomers was Galileo Galilei, who in 1610 used a crude refractor to project

Spectroheliographs isolate light of a single wavelength and create an image of the Sun's full disk by scanning it, line by line. This can result in images with stunning contrast.

THE FUTURE OF SOLAR IMAGING

Future innovations promise even sharper views. These include improved etalon designs and adaptive optics for ground-based telescopes, as seen on facilities like

the Daniel K. Inouye Solar Telescope. For now, the combination of narrowband filters, dedicated solar cameras, powerful processing software and educational YouTube tutorials have made the Sun more approachable, inviting new enthusiasts to witness the Sun's restless beauty firsthand.

Whether it's a parade of

sunspots, feisty active regions, or ever-changing prominences and spicules on the limb, observing the Sun promises something new every day for both curious beginners and seasoned astrophotographers. With a modest Ha scope, you too can explore a star that's both familiar and endlessly surprising. As solar imaging

continues to evolve, one thing is certain: We'll keep finding new and better ways to capture the Sun's light. ☼

Mark Johnston is a NASA solar system ambassador, vice president of the Phoenix Astronomical Society, ACEAP astronomy ambassador to Chile, and the Telescope.Live ambassador for solar imaging.

Sunspot AR 4274: A Flare Powerhouse of Solar Cycle 25

by Richard Meyers

Active Region (AR) 4274 emerged as one of the defining features of Solar Cycle 25, unleashing a barrage of powerful eruptions in early-to-mid November 2025 that rippled through near-Earth space and triggered vivid auroras in Earth's upper atmosphere. Its volatile behavior not only highlighted the Sun's raw power but also underscored the vulnerabilities of our technology-reliant society orbiting an active star.

A magnetically complex AR 4274 rotated onto the visible solar disk from the far side in late October 2025, revealing a rapidly evolving structure with twisted magnetic fields primed for instability. By early November, as it crossed the central, Earth-facing disk, its magnetic classification escalated to the highly tangled beta-gamma-delta configuration—a hallmark of regions capable of major flares and eruptions.

Over about 10–12 days, the region ballooned to a peak area of around 850 millionths of the solar hemisphere (MSH), ranking it among the larger sunspot groups of this cycle and captivating professional observatories (e.g., NASA's SDO) alongside amateur solar imagers worldwide.

A Chain of Escalating Flares: AR 4274 wasted no time asserting its potency, erupting with an X1.8 flare on November 4 that triggered an R3-level radio blackout, disrupting high-frequency (HF) communications across Earth's sunlit hemispheres. The fireworks intensified over the following week: an X1.7 flare on November 9 and an X1.2 flare on November 10, each accompanied by fast coronal mass ejections (CMEs) clocked at 800–1,300 km/s—events with high potential to rattle Earth's magnetosphere and spark geomagnetic storms.

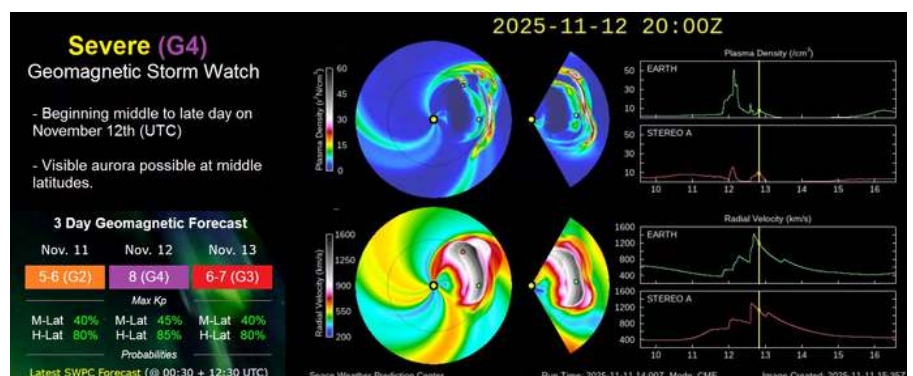
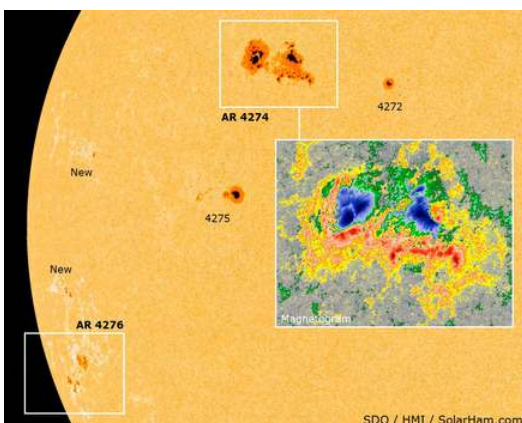
The crescendo arrived on November 11, as AR 4274 unleashed an X5.1–X5.16 flare, the most intense of 2025 and the sixth-strongest of Solar Cycle 25 overall. This beast hurled a full-halo CME toward Earth at speeds of 1,350–1,950 km/s, arriving the next day to fuel G3–G4 geomagnetic storms and brilliant auroral displays as far south as mid-latitudes. Even as the region edged toward the western solar limb, it stayed restless, capping its passage with an X4.0 flare on November 14 that amplified the week's cumulative space weather effects.

Storms, Auroras, and Risks: The barrage of X-class flares and associated CMEs from AR 4274 sparked multiple R3 (strong) radio blackouts, briefly severing high-frequency (HF) communications vital for aviation, maritime operations, and remote sensing—disruptions rippling across the sunlit hemispheres during each event. With several fast CMEs—speeds exceeding 1,300 km/s—launched in rapid succession, forecasters highlighted potential "cannibal" interactions en route, where faster ejections overtake slower ones, amplifying geomagnetic effects and muddying arrival-time predictions.

NOAA's Space Weather Prediction Center responded with watches for strong (G3) geomagnetic storms, escalating to a rare G4 (severe) alert for the super-fast November 11 CME—ultimately yielding observed G3 conditions on November 12–13, with auroras dancing at unusually low latitudes (as far south as northern California and Alabama in forecasts). These disturbances heightened risks to power grids (via geomagnetically induced currents), satellites (increased atmospheric drag and radiation exposure), and navigation systems (GPS signal scintillation), reinforcing the need for precise space weather forecasts in our interconnected world.

AR 4274's Place in Solar Cycle 25: AR 4274's exploits unfold amid Solar Cycle 25's robust peak—now confirmed stronger than early predictions, with smoothed sunspot numbers cresting at ~155 in July 2024 (versus the forecasted 115) and flare rates sustaining high activity into late 2025. The region's blend of expansive size, intricate beta-gamma-delta magnetism, serial X-class flares, and high-speed CMEs positions it as a prime benchmark for probing active region dynamics and extreme space weather drivers.

To heliophysicists, AR 4274 serves as a stellar proving ground for refining models of flare triggers, CME propulsion, and inter-CME collisions amid a dynamic solar wind. For the rest of us, it's a stark alert: the Sun's serene visage can erupt without warning, transforming space weather from esoteric science into a tangible force shaping our tech-driven lives on Earth



Astroimaging Special Interest Group (ASIG)

Your astroimages have been stunning—each galaxy spiral and nebular glow pushes our group's passion deeper into the cosmos.

Monthly Target Challenge:

Easy (Small Telescopes)

M31 – Andromeda Galaxy (Andromeda)

The grandest galaxy in the night sky and visible even to the naked eye under dark skies. Small scopes reveal its bright core and faint oval shape; look for its companions M32 and M110 nearby.

M45 – Pleiades (Taurus)

A beautiful open cluster of hot blue stars that sparkle like diamonds. Through binoculars or a small telescope, the cluster fills the field of view—perfect for beginners and outreach nights.

M42 – Orion Nebula (Orion)

Visible late in the month as Orion rises earlier. This glowing stellar nursery is bright even under suburban skies. Small scopes easily show its greenish core and the Trapezium star cluster inside.

Challenge (Large Telescopes)

NGC 891 – Edge-on Spiral Galaxy (Andromeda)

A stunning edge-on galaxy with a dark dust lane bisecting its bright core. A great test of sky transparency and contrast—magnificent under dark skies.

NGC 2392 – Eskimo Nebula (Gemini)

A compact planetary nebula with a bright core and halo resembling a parka hood. Responds beautifully to higher magnification; try an O III filter to bring out structure.

NGC 1499 – California Nebula (Perseus)

A large, faint emission nebula best captured with wide-field imaging setups or viewed with a narrowband filter. Its elongated shape resembles the outline of California—perfect for astrophotographers.

Helpful YouTube channels

[AstroBackyard](#) – Excellent for beginner and intermediate astrophotographers, covering gear, imaging techniques, and post-processing.

[Nebula Photos](#) – Focuses on budget astrophotography, including DSLR and smartphone imaging.

[Peter Zelinka](#) – Great for nightscape and deep-sky astrophotography techniques.

[Chuck's Astrophotography](#) – Covers deep-sky imaging, processing tutorials, and equipment reviews.

[NSN Webinar Series: JWST: Revealing the Invisible Universe](#) - Principal Science Visuals Developer Joseph DePasquale will provide some background on the observatory and the art and science of image processing that reveals the inherent beauty of the infrared universe.

[Mastersofpixinsight](#)-Masters of PixInsight is an educational platform dedicated to teaching astrophotographers how to effectively use PixInsight for deep-sky image processing.

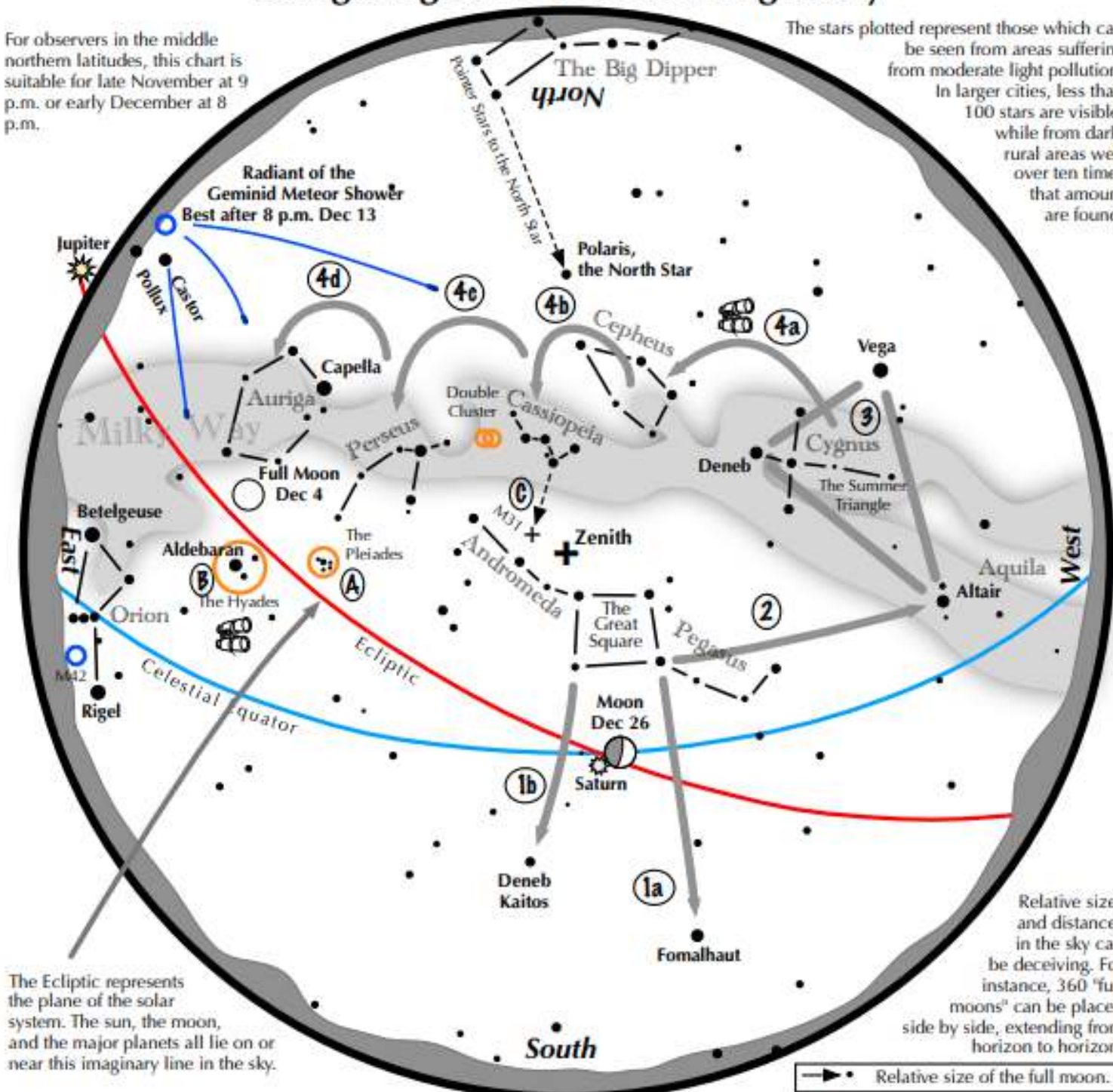
[20 Top TIPS for Better Astrophotography](#) Dylan O'Donnell Dylan covers both image acquisition as well as processing and provides some great tips for better images.

Navigating the December Night Sky

2025

For observers in the middle northern latitudes, this chart is suitable for late November at 9 p.m. or early December at 8 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.



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

- 1 Face south. Almost overhead is the "Great Square" with four stars about the same brightness as those of the Big Dipper. Extend an imaginary line southward following the Square's two westernmost stars. The line strikes Fomalhaut, the brightest star in the southwest. A line extending southward from the two easternmost stars, passes Deneb Kaitos, the second bright star in the south.
- 2 Draw another line, this time westward following the southern edge of the Square. It strikes Altair, part of the "Summer Triangle."
- 3 Locate Vega and Deneb, the other two stars of the "Summer Triangle." Vega is its brightest member while Deneb sits in the middle of the Milky Way.
- 4 Jump along the Milky Way from Deneb to Cepheus, which resembles the outline of a house. Continue jumping to the "W" of Cassiopeia, to Perseus, and finally to Auriga with its bright star Capella.

Binocular Highlights

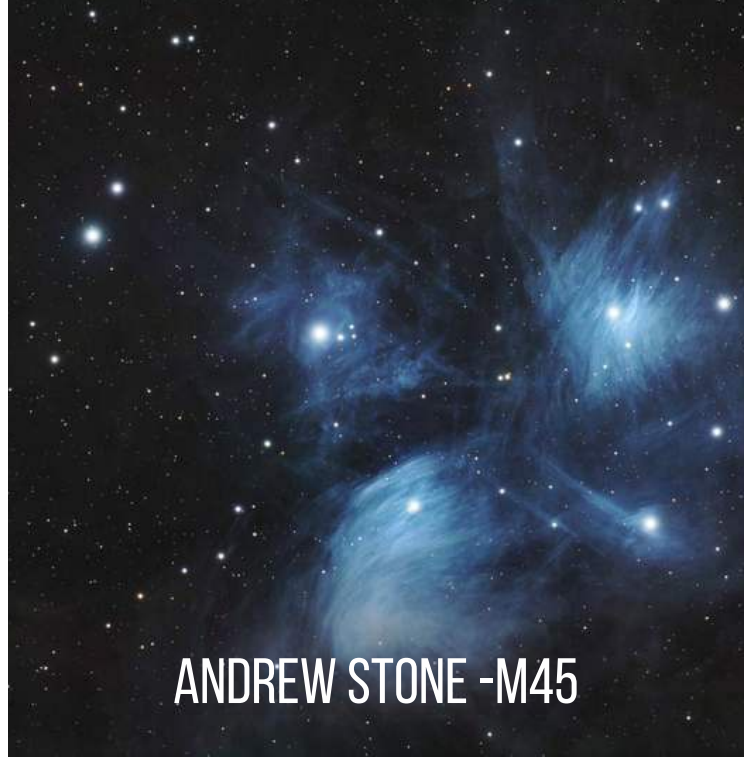
A and B: Examine the stars of the Pleiades and Hyades, two naked eye star clusters.

C: The three westernmost stars of Cassiopeia's "W" point south to M31, the Andromeda Galaxy, a "fuzzy" oval.

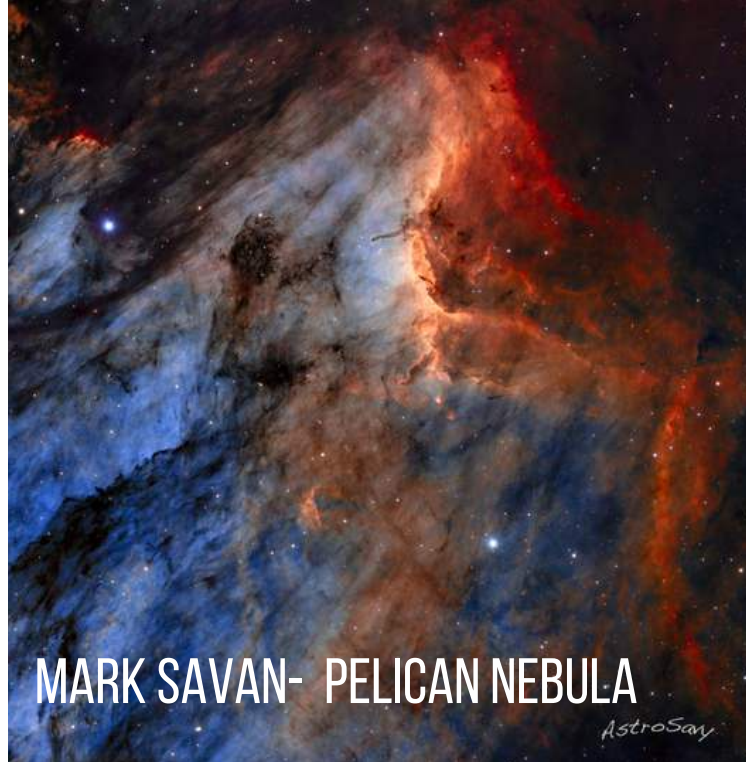
D: Sweep along the Milky Way from Altair, past Deneb, through Cepheus, Cassiopeia and Perseus, then to Auriga for many intriguing star clusters and nebulous areas.



Astronomical League www.astroleague.org/outreach; duplication is allowed and encouraged for all free distribution.



ANDREW STONE -M45



MARK SAVAN- PELICAN NEBULA

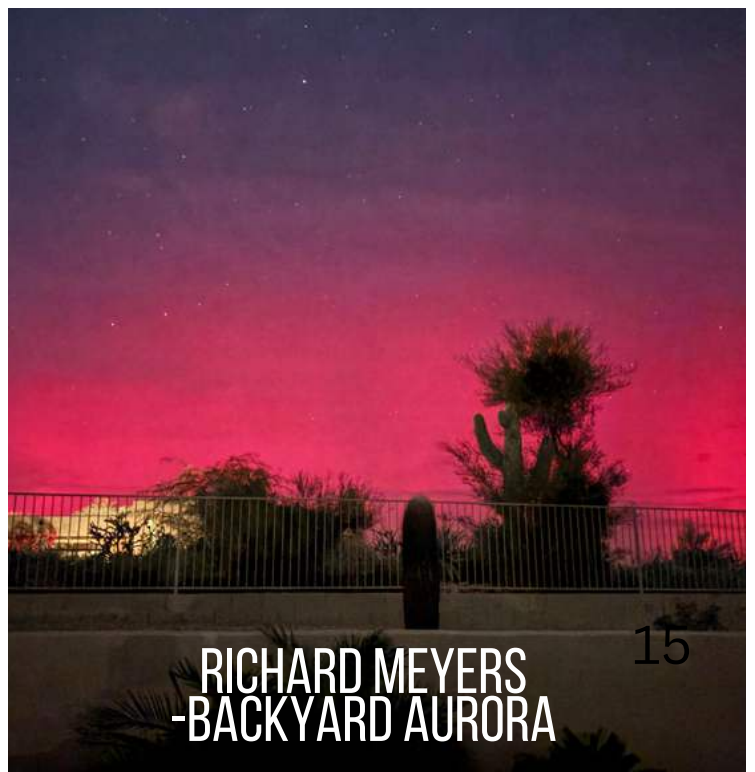
AstroSay



ANDREW STONE -M45



CACYRUS MOUSAVI-M16



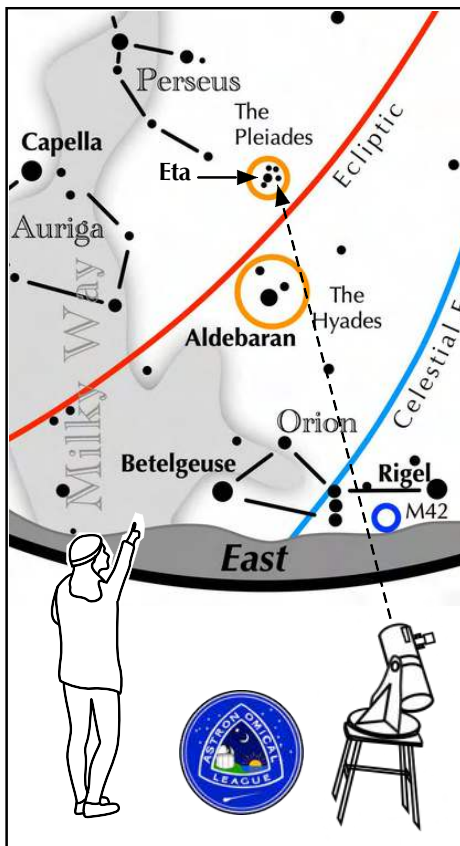
RICHARD MEYERS
-BACKYARD AURORA

7 Telescope Targets

Each month, we feature 7 good targets for small telescopes that should be visible in the evening. The targets are:

1. NGC869/884 Double Cluster The nicest pair of side by side open clusters in the sky. Visible to the naked eye from dark sites.
2. Eta Persei Nice blue/yellow binary star
3. M103 Just in time for Christmas, this open cluster looks much like a Christmas tree
4. NGC7789 Caroline's Rose Discovered by Caroline Herschel, a beautiful star cluster that appears like looking into a rose
5. NGC457 Owl cluster A star party favorite, this star cluster looks just like its namesake.
6. NGC 891 Silver Sliver galaxy Edge on galaxy with a conspicuous dust lane bisecting the top and bottom
7. Gamma Aries Yellow/red binary star

ASTRONOMICAL LEAGUE Double Star Activity



Other Suns: Eta Tauri (Alcyone)

How to find EtaTauri on a December evening *Face east*.

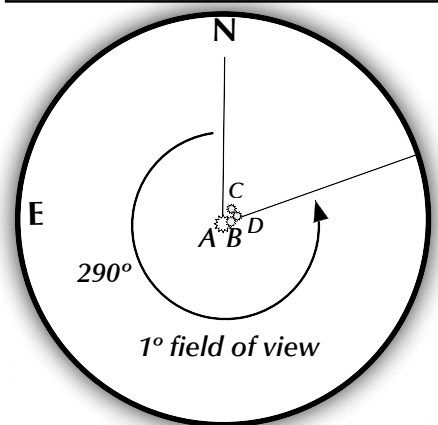
Look for the Pleiades star cluster. Eta Tauri is the cluster's brightest member. It is a quadruple star.

Eta Tauri A-B
 separation: 118 sec
 A magnitude: 2.8
 B magnitude: 6.3
 Position Angle: 290°

A-C separation: 182 sec
 C magnitude: 8.2
 Position Angle: 313°

A-D separation: 192 sec
 D magnitude: 8.7
 Position Angle: 296°

Suggested magnification: >20x
Suggested aperture: >3 inches



How do you find celestial objects?

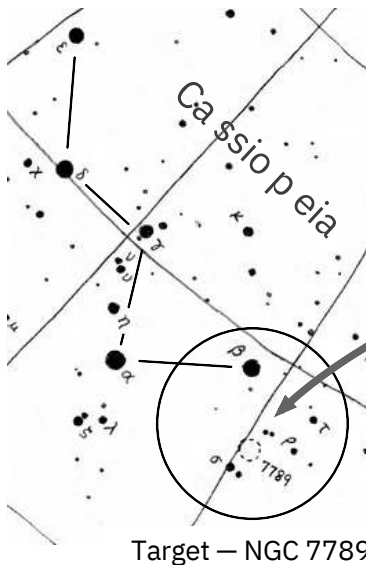
★ Finding celestial targets the modern way ★

Computerized "GoTo" telescopes ... the quick and easy method:

- 1 Level the telescope mount
- 2 Point the tube towards north
- 3 Indicate the date and time
- 4 Indicate observing location
- 5 Center on first guide star
- 6 Center on second guide star
- 7 Enter the target's designation
- 8 The scope automatically slews to it



★ Finding celestial treasures the old fashioned way ★



Target — NGC 7789



1 Learn the stars and constellations

- ★ There is no substitute for sitting under the stars with a map and red flashlight.
- ★ Use a star map that plots all stars visible to the unaided eye.
- ★ Start by finding well-known star patterns such as the Big Dipper, or the constellation of Orion or Cassiopeia.
- ★ Continue by identifying neighboring star patterns.

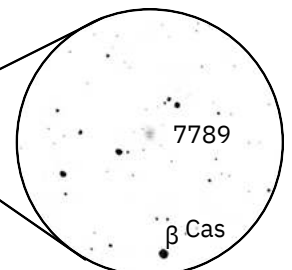
2 Finderscope: little scope, big view

Why a finderscope?

- ★ Gives a wide field of view, about 5°,
- ★ Must be aligned with the main telescope,
- ★ Only the bright planets, brighter nebulae and star clusters are visible.

Simply...

- ★ Point the finder at a suitable guide star, or
- ★ Triangulate to the object by using nearby recognizable stars.



Finderscope view, note the upside-down image

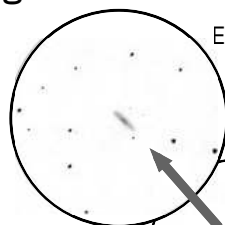
3 Star Hopping: finding the faintest of objects...

Before hopping begins:

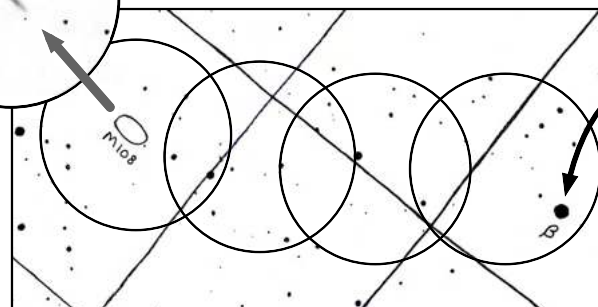
- ★ Must have a **detailed** star map.
- ★ Must know the field of view of the eyepiece.

As an example, find galaxy M108:

- ★ Begin hopping at a reference star, in this case Beta (β) Ursae Majoris in the Big Dipper.
- ★ Match the stars on the map with those in the eyepiece.
- ★ Hop among the stars in each subsequent field of view until the correct field is reached.
- ★ Look closely to see the dim galaxy M108.



Eyepiece view of M108



Star hopping to M108 from Beta Ursae Majoris



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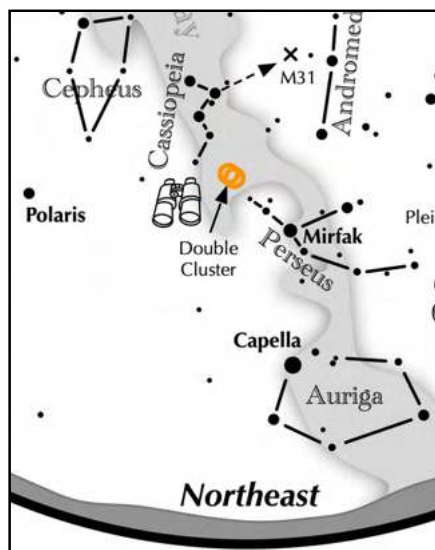


Can you easily find this open cluster showpiece?

Every Curious Skywatcher should know how to find the Double Cluster



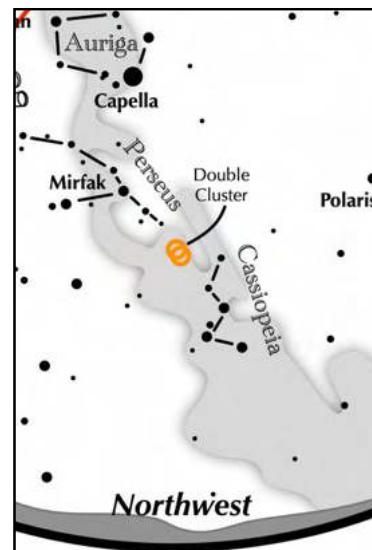
Visible in the early evening sky from late October through late March.



November in the northeast

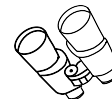


January facing south
looking past the zenith



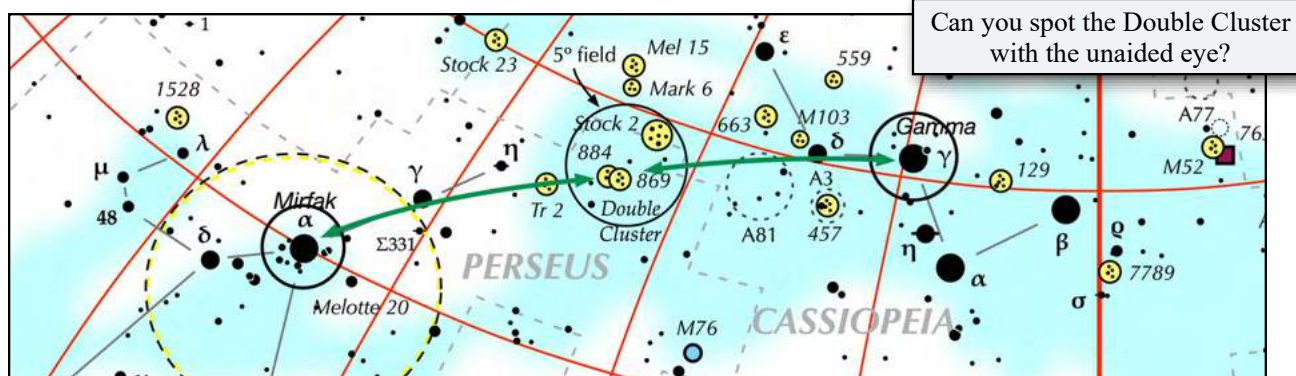
March in the northwest

The **Double Cluster** can be spotted with unaided eye from a dark sky as a dim glow in the Milky Way between Perseus and Cassiopeia. Through 10x50 binoculars, it is an obvious sight, revealing its brighter glittering lights. The neighboring cluster, **Stock 2**, can be seen as a much dimmer and more spread out grainy glow.



How to find the Double Cluster (aka NGC 869 & 884, and Caldwell 14):

1. Find the "w" shaped constellation Cassiopeia and the neighboring constellation to its southeast, Perseus. Identify Perseus' brightest star, 1.8 magnitude Mirfak.
2. Midway between the center star of Cassiopeia's "w" (Gamma Cas) and Mirfak lies a soft glow.
3. Binoculars aimed at the glow reveal the famous Double Cluster, also called NGC 869 and 884, Caldwell 14, and h Persei and Chi Persei.
4. Place the Double Cluster near the southern edge of the field. Near its center lies Stock 2, the Musclemans Cluster, which appears as a large, dim grainy glow.



Helpful Astronomy Websites

by Mark Johnston

The following websites are great free resources to help you plan and enjoy your astronomy adventures

Astromart: astromart.com/

This is one of the top two sites for buying and selling used astronomy gear, product reviews, and forums where you can discuss any aspect of astronomy with other enthusiasts. A small fee is required.

Astrometry.net: <https://nova.astrometry.net/>

This site will take any astronomy image you send it (galaxy, starfield, nebula, etc) and then tell you what it is and where it is in the sky.

Astronomy Tools: astronomy.tools/calculators/field_of_view/

This site has a lot of capabilities but I use it primarily to figure out how a target (e.g. the Helix nebula) will look in my eyepiece or astronomy camera. You pick your scope, camera, eyepiece and target and the site does the rest.

Astrospheric: www.astrospheric.com/

Probably the best short term astronomy weather forecasting tool, providing predictions of clouds, transparency and seeing.

Clear Sky Charts: www.cleardarksky.com/

Excellent source of astronomy seeing conditions forecast. Also a great tool for finding observing sites with lower light pollution.

Cloudynights: www.cloudynights.com/

This is one of the top two sites for buying and selling used astronomy gear, product reviews, and forums where you can discuss any aspect of astronomy with other enthusiasts. Free.

Dark site finder: darksitefinder.com/map/

Great website for finding a dark observing location.

Heavens above: heavens-above.com/

Top site for predicting naked eye observations of satellites. See when the ISS is visible in your neighborhood!

Jupiter transits: shallowsky.com/jupiter/

For anyone with a small telescope, this is a great site. You can find out when the Great Red Spot and Jupiter's satellite transits are visible.

Solar Dynamic Observatory (SDO): <https://sdo.gsfc.nasa.gov/data/>

Find out how the Sun looks right now, at various wavelengths. If you own a solar telescope, this site coupled with Astrospheric is all you need to plan fabulous solar observing!

Starizona: <https://starizona.com/>

Astronomy store located in Tucson, Arizona. They specialize in a wide range of astronomy equipment and accessories, catering to both amateur and professional astronomers. Their offerings include telescopes, cameras, filters, and eyepieces, among other products. Knowledgeable staff and passion for astronomy.

Telescopius: telescopius.com/

This site is very helpful in planning an observing evening. It will tell you when any particular target is rising and setting and when is the best time to observe it. This allows you to sequence your observing in a planned manner.

Used equipment for sale

Duration: Ads run for 3 months and may be renewed if submitted by the deadline and space permits.

Cost: Ads are FREE for members only. Equipment Requirements: All items must be in good working order.

Acceptable items include books, star charts, telescopes, eyepieces, finder scopes, binoculars, lasers, and other astronomy-related gear. Submission Details: Email the following information to editor@pasaz.org: **Make *Model *Description (Under 100 words-include a link to the manufacturer's site if available) *Price *Contact Information *Preferred Contact Method(Email or phone) *Approximate Location*

PAS is not responsible for the ads and does not guarantee the quality of the items for sale. PAS reminds everyone, you purchase at your own risk, so do your research beforehand.

NEW-12/2025 Thinning the herd a little bit more. 41MM ,Body is in great condition. Optics are clean with no blemishes. Includes paperwork on features and design. Price on the Panoptic is \$450, Price includes PayPal and shipping to the lower 48. Any questions? Please get in touch. m42astronomer@gmail.com



PAS offer: This is a first come, first served offer. Review the list. Decide what you want. Email president@pasaz.org what you want. He will set up a day/time for you to come to his location to purchase.

Bring your check payable to Phoenix Astronomical Society or cash ... no credit cards please.



Various Filters – 1.25"

Red, Yellow, Blue, Green, Multiple O3 filters

Member Price: \$100

Telescope Loan Program

The PAS Telescope Loan Program provides PAS active members access to various donated telescopes and accessories to enhance their learning of visual astronomy as well as astrophotography.

Check-out Process: The entire PAS inventory of telescopes is available for active members to use. Some telescopes require completion of a training program, others do not. Several of the loaner telescopes represent a significant dollar value. In certain cases, the PAS member will be asked to provide credit card information as insurance against potential damage or loss.

A kit of eyepieces and accessories is available for all loaner telescopes if needed. There is also a special kit of advanced 2" eyepieces available for loan as well as advanced finder scopes. Laser collimation tools are also available for loan if needed.

Loan periods are for a maximum of one month. However, longer periods may be granted in special cases.

All telescope equipment and accessories must be picked up at the PAS storage facility and delivered back to the facility by the end of the loaner period. If you wish to check out one of PAS's telescopes, send an email to telescope@pasaz.org with the following information:

- Full Name
- Email Address
- Desired Telescope and/or accessory kit
- Check out date
- Check in date
- Additional information as needed

ZWO SeeStar S50

Coronado Personal Solar Telescope (PST)

Orion SkyQuest XT-10 - 10" Dobsonian

Orion Skyquest XT-8 – 8" Dobsonian

Meade ETX-70 Go-To Refractor

Sky-Watcher – 10" Collapsible Motorized Dobsonian

Accessory Kit #4 - Advanced Observing

Accessory Kit #5 – 1.25" Eyepieces & filters

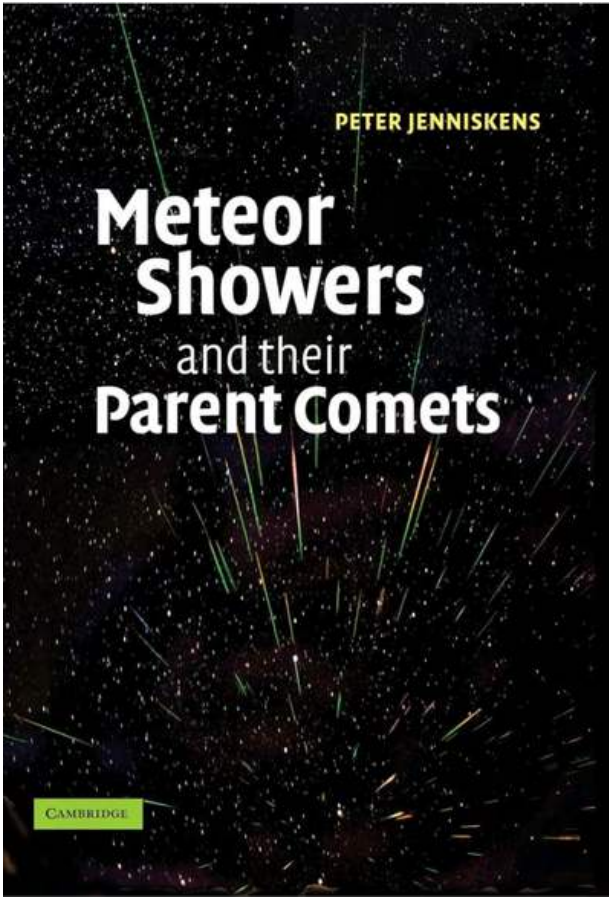




Meteor Showers and Their Parent Comets
by Peter Jenniskens

Peter Jenniskens’s Meteor Showers and Their Parent Comets is a definitive guide to understanding and observing meteor showers. The book explores the science behind meteor showers, their origins in comets, and when to expect these dazzling sky events. Jenniskens provides in-depth information about major meteor showers and their associated comets, along with tips for observing them. For anyone fascinated by the beauty and mystery of meteors, this book offers everything needed to fully appreciate these celestial spectacles.

Verdict: An essential guide for meteor enthusiasts, combining scientific insight with practical observing advice. A must-read for anyone interested in celestial events like meteors and comets.



13

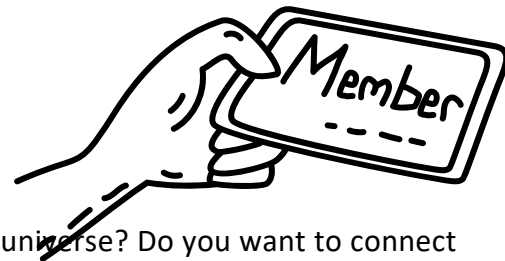
SAT

BOOK CLUB-MEMBERS ONLY

The beauty of falling : a life in pursuit of gravity,
Claudia de Rham, 2024
Please reach out to: saeidmousavi@yahoo.com



Sign Up



Are you fascinated by the stars and eager to explore the wonders of the universe? Do you want to connect with like-minded individuals who share your passion for astronomy?

Hi everyone! Great news. Renewing your membership is quick and easy: just visit www.pasaz.org, look in the left index column for “Join Our Society,” click it, and you’re on your way.



We now offer a year-round membership, which means you can join at **any time with no enrollment deadlines**, and you’ll receive a full 12 months of benefits. If you have any questions, our Membership Manager is happy to help at membership@pasaz.org.



Benefits of PAS Membership



- Helping the Society accomplish its mission of astronomy outreach and education
- Contributing toward the Society’s ability to provide college scholarships to astronomy students
- Participation on the Society’s email distribution list
- Email receipt of the Society’s monthly newsletter
- Participation in the Society’s telescope loaner program
- Ability to serve as a teacher at the Society’s telescope workshops
- Ability to serve as a mentor at the Society’s star parties
- Ability to participate in the Astro Imaging Special Interest Group (ASIG)
- Ability to serve as a paid presenter in the Society’s Star Tours program
- Opportunity to purchase used astronomical equipment at 50% off current value
- Access to club trips to the darkest Arizona sites and top observatories
- Connections with professional astronomers and researchers through guest lectures or workshops.
- Opportunities to hold leadership positions within the club, such as committee chairs or officers.

By becoming a member of the Phoenix Astronomical Society, you not only enhance your own astronomical journey but also contribute to a vibrant community that shares your passion. Together, let's explore the universe and inspire others to do the same.

Sign Up Now and Start Exploring the Cosmos with Us!



Phoenix Astronomical Society Contact Info

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Vice President	Mark Johnston	vicepresident@pasaz.org
Treasurer	Richard Sauerbrun	treasurer@pasaz.org
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Newsletter Editor	Richard Meyers	editor@pasaz.org
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Member-at-Large	Damon Finell	mal2@pasaz.org
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Event Manager	Ruza Sabelja	events@pasaz.org
Website Manager	Ed Skinner	webmaster@pasaz.org

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Star Tours Team 2025

These individuals have successfully met the qualifications to participate in Star Tours Events and receive compensation for their services.

Mark Johnston
Ted Blank
Mark Savan
Andrew Stone-Star Tours Manager
Richard Sauerbrun
Stu Brackney
Roger Anzini
Peter Turner
Chris Ford
Scott Adams
Ryder David
Alessandro Cavallaro
Richard Meyers

