

PrimeFocus

August 2024



WHEN:

August 16, 2024
Doors open at 7:00pm
Meeting at 7:30pm
Lecture at 8:00pm

WHERE:

Unitarian Church
1893 North Vasco Rd.
Livermore, CA 94551
and via Zoom

TVS QR CODE

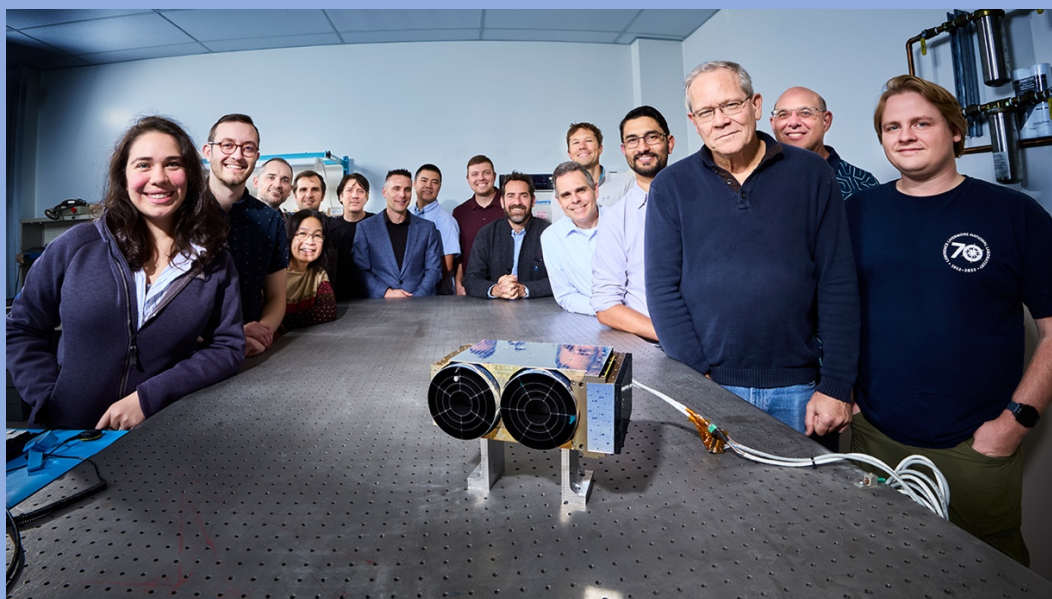


INSIDE THIS ISSUE:

News and Notes	2
Calendar of Events	3
Cosmic Sprinkler	4-5
TVS Astrophotography	6
What's Up	6
Navigating the Night Sky – July 2024	7
NASA Night Sky Notes	8-9
Membership / Renewal Application	10

DEEP PURPLE: LLNL UV SWIR SENSOR FOR NASA CUBESAT FRANK RAVIZZA

Deep Purple is an optical sensor for NASA's Platform Technology Demonstration program. It was designed and built by Lawrence Livermore National Laboratory (LLNL) on internal funding in under one year. It will fly on a 6U "Trestles" Terran Orbital satellite called PTD-R with a primary mission to demonstrate new technologies. It features twin 8.5-cm aperture telescopes using LLNL's patented monolithic optics technology that offers high-assurance of diffraction limited performance in a small volume. About the size of a shoe box, its twin apertures are sensitive to Short Wave Infrared (SWIR) and Ultraviolet (UV) light in the 1000-1700 nm and 230-310 nm bands. Its cameras are industrial machine vision commercial off-the-shelf using recent advances in image sensor technology from Sony. Within its 2U payload, Deep Purple also features an Nvidia Jetson ARM and GPU powered payload computer for onboard processing with AI/ML capabilities. The optics housings are fabricated in a compression molded carbon composite material replacing low thermal expansion Invar to provide a one-sixth reduction in mass. Its payload computer will be cooled by a high thermal conductivity carbon composite radiator fabricated using the same process by Patz Materials Technology. Deep Purple's secondary mission will demonstrate low-cost UV astronomy, detection and tracking of near Earth objects, and ground observation in the SWIR.



In January 2024, the Space Hardware team fully qualified its Deep Purple payload, which will be on board NASA's Pathfinder Technology Demonstrator-R, scheduled to launch this summer. Once operational, Deep Purple will observe ultraviolet and short-wave infrared light. (Photo: Garry McLeod).

Frank Ravizza is an optical engineer at the Lawrence Livermore National Laboratory. Currently, he is lead optical engineer for the Lab's space program that builds optical sensors for space missions. His Lab career started in 2003 as a student intern. His

Continues to Page 2

PrimeFocus

Deep Purple Continued

history with the Lab extends much further back to when he would come to work with his father. As a young boy he made an impression by helping PhD physicists graph data on their Macintosh. At the end of a long day, he once asked, “Dad: You really get paid to do this?”

Frank aspired to work on the National Ignition Facility, to play a role in the long standing and ambitious effort to achieve fusion ignition—using giant lasers. To Frank, there was nothing cooler—except for driving race cars and flying fighter jets. Both were career ambitions before settling into Lab life. The National Ignition Facility (or “NIF”) went on to make global headlines in 2022 for achieving ignition. This means here in Livermore, NIF demonstrated that fusion energy gain in a controlled process is possible, sparking renewed interest in fusion power plants.

Upon graduating with a Bachelors in Optical Science in 2006 from UC Davis, Frank eagerly took the first opportunity to work on NIF as an optical metrology technician. However, Frank soon failed as technician when he began redesigning the Lab, inventing new instruments. One of which became the subject of his Master’s Thesis completed in 2013 from University of Arizona. This instrument is still vital to the operation of the NIF because it locates flaws on optics that act like microlenses and damage downstream optics by intensifying laser light. A decade later, when introduced to gravitational microlensing by an astrophysicist, Frank immediately recognized: Yes, I have experience designing instruments to find microlenses!

In 2014, Frank was recruited internally to work on a high average power laser that promised to provide boost phase missile defense. Another really cool laser, but not for fusion—for shooting down missiles. Frank became beam quality modeling lead for this project. In 2019, Frank was again recruited internally, this time to the Lab’s rapidly growing space program. Today, Frank spends much of his time thinking of creative ways to capture data for astrophysics in the most efficient and cost-effective way possible.

NEWS AND NOTES

2024 Meeting Dates

Club Meeting	Board Meeting	PrimeFocus Deadline
Aug. 16	Aug. 19	Aug. 3
Sept. 20	Sept. 23	Sept. 3
Oct. 18	Oct. 21	Oct. 5

Money Matters

As of the last Treasurer’s Report on 7/22/24, our club’s account balance is \$46,850.96, this includes \$13,102.47 in the H2O Rebuild fund.

TVS Welcomes New Members

TVS welcomes new members Vinoth Sekar and Randy John. Please say hello and chat with him during our meetings.

2024 TVS Club Star Party Schedule

Save the dates for the 2024 Club Star Parties. Del Valle star parties are also public outreach events. They are jointly hosted with the EBRPD and held at the Arroyo Staging Area (Coords: 37.6196638, -121.7528899). The public is invited for the first 1.5-2 hours, while club members can stay the remainder of the night.

September 7: Club/public star party at Del Valle Arroyo Road Staging Area. Set-up at 7:30pm, Observing 6:30 until 9:00pm.

Tesla Vintners star parties are open to only club members and their guests. These star parties end at midnight, but participants can leave earlier, should they wish.

August 31: Tesla Vintner’s Star Party, 5143 Tesla Rd., Livermore. Set-up at 7:30pm, Observing 8:15-Midnight.

October 26: Tesla Vintner’s Star Party, 5143 Tesla Rd., Livermore. Set-up at 6:00pm, Observing 6:15-11-30pm.

H2O Open House star parties are open to only club members and their guests. The open house ends at midnight, and all participants are encouraged to stay the duration. The drive to H2O takes about 1 hour, and the caravan leaves promptly from the corner of Mines and Tesla Rds. No gas stations are available on the route, so be prepared. Admission is \$3/car-bring exact change. H2O is a primitive site with two porta-potties. Bring water, food, and warm clothing, as needed. Red flashlights are to be used so observers can preserve their night vision.

Sept 28: H2O Open House, at 5pm the caravan to H2O PROMPTLY leaves the corner of Mines and Tesla Rds., Livermore. Observing until 11:30pm.

CALENDAR OF EVENTS

August 16, 17, 23, 24, 30, 31 September 6, 7, 13, 14, 7:30-10:30 PM

What	Free Telescope Viewing
Who	Chabot Staff
Where	Chabot Space and Science Center, 10000 Skyline Blvd. Oakland, CA 94619
Cost	Free

Join Chabot astronomers on the Observatory Deck for a free telescope viewing! Weather permitting, this is a chance to explore stars, planets and more through Chabot's historic telescopes. Chabot's three large historic telescopes offer a unique way to experience the awe and wonder of the Universe. Three observatory domes house the Center's 8-inch (Leah, 1883) and 20-inch (Rachel, 1916) refracting telescopes, along with a 36-inch reflecting telescope (Nellie, 2003).

Are the skies clear for viewing tonight? Viewing can be impacted by rain, clouds, humidity and other weather conditions. Conditions can be unique to Chabot because of its unique location in Joaquin Miller Park. Before your visit, check out the [Weather Station](#) to see the current conditions at Chabot.

For more information, see:
<https://chabot.space.org/events/events-listing/>

September 9, 7:30 PM

What	Alien Oceans: NASA's Europa Clipper Mission
Who	California Academy of Sciences
Where	Morrison Planetarium; 55 Music Concourse Drive, San Francisco, CA 94118
Cost	Public: \$15; Members and seniors: \$12

NASA is launching a spacecraft to Jupiter's ocean moon Europa in October 2024 to learn more about its potential habitability. Scientists describe Europa as an "ocean world" because decades of evidence from analysis of spacecraft observations strongly suggest that an ocean of liquid water is hidden beneath the moon's icy surface. The search for life beyond Earth is one of NASA's primary objectives. If humans are to truly understand our place in the Universe, we must learn whether our planet is the only place where life exists. Life needs a source of energy, the presence of

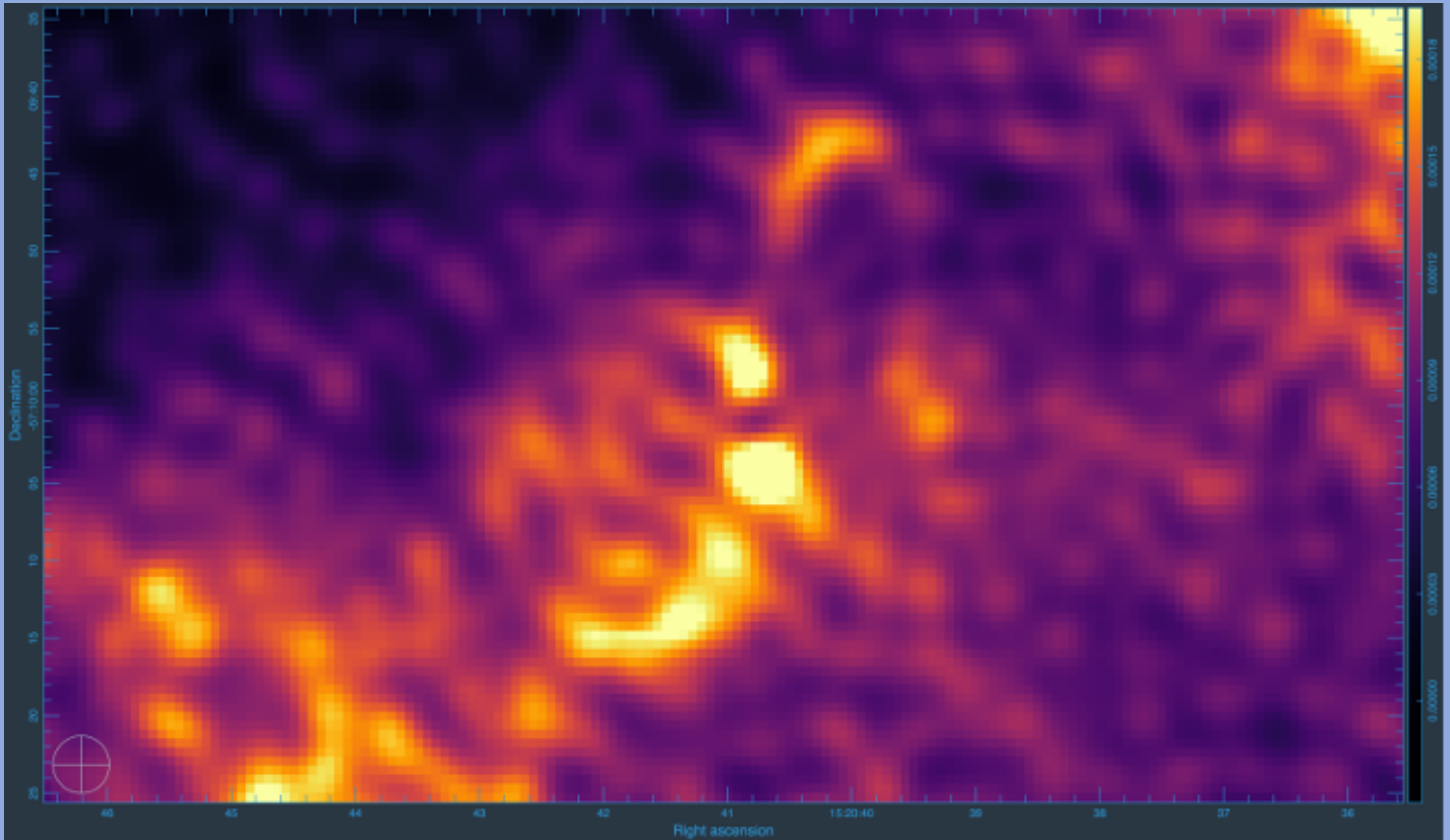
certain chemical compounds, and temperatures that allow liquid water to exist. Jupiter's ocean moon Europa seems to be just such a place! Join us to learn more about Europa and why NASA wants to go there.

This lecture is in connection with a special limited roadshow, Voyage of Europa Clipper: Exploring an Alien Ocean, at the Academy September 4-9. We will open our doors early at 6:00 pm for your last chance to see a model of the spacecraft, conduct hands-on experiments, marvel at a giant model of Jupiter's moon, snap a photo "on the moon," and more!

Dr. Kevin Peter Hand is a planetary scientist at NASA's Jet Propulsion Laboratory in Pasadena, California, where he directs the Ocean Worlds Lab. His research focuses on the origin, evolution, and distribution of life in the solar system with an emphasis on Jupiter's moon, Europa. From 2011 to 2016 he served as Deputy Chief Scientist for Solar System Exploration at JPL, and from 2015-2023 he was Project Scientist for the NASA's Europa Lander mission concept. He is the Principal Investigator of the SHERLOC spectrometer onboard the Mars Perseverance rover, which is tasked with seeking signs of habitability and past life on Mars. He is also a Co-I on the Europa Clipper mission, and a Co-I on the Titan Dragonfly mission. His work has brought him to the Dry Valleys of Antarctica, the sea ice near the North Pole, the depths of the Earth's oceans, and to the glaciers of Kilimanjaro. Dr. Hand was a scientist onboard James Cameron's 2012 dive to the bottom of the Mariana Trench, and he was part of a 2003 IMAX expedition to hydrothermal vents in the Atlantic and Pacific oceans. He has made nine dives to the bottom of the ocean. In 2011 he was selected as a National Geographic Explorer. His book 'Alien Oceans: The Search for Life in the Depths of Space', was published in 2020 by Princeton University Press. He was born and raised in Manchester, Vermont.

For more information, see:
<https://www.calacademy.org/events/benjamin-dean-astronomy-lectures/alien-oceans-nasas-europa-clipper-mission>

COSMIC SPRINKLER: NEUTRON STAR'S BIZARRE JET SAANIKA KULKARNI



The 'S'-shaped phenomenon captured by MeerKAT. Credit: Fraser Cowie

Astronomers have recently spotted a celestial sprinkler unlike any other. A neutron star, the ultra-dense remnant of a massive star's core, has been observed emitting a jet of material in a bizarre, S-shaped pattern, resembling water spraying from a garden sprinkler. This unprecedented phenomenon, captured by the MeerKAT radio telescope in South Africa, has surprised and intrigued scientists, offering new insights into the extreme physics governing these stellar powerhouses.

Unveiling the S-shaped Jet

The neutron star in question resides within the binary system Circinus X-1, located over 30,000 light-years from Earth. Neutron stars are renowned for their incredible density; a teaspoon of their material would weigh as much as Mount Everest. This particular object formed from the core of a colossal supergiant star that collapsed, leaving behind an incredibly compact and rapidly spinning object.

The S-shaped jet is believed to be caused by the wobbling, or precession, of a disc of hot gas surrounding the neutron star. As the disc wobbles, the jet's direction changes, creating the distinctive curved pattern. While precession has been observed in black holes, this is the first time it has been witnessed in a neutron star, marking a significant breakthrough in our understanding of these celestial bodies.

Implications and Future Research

This discovery not only provides a captivating visual spectacle but also offers valuable insights into the extreme physics at play in neutron stars. The symmetrical S-shape of the jet and the accompanying fast, wide shockwave are telltale signs of a precessing jet. By studying this phenomenon, scientists can unravel the mysteries of how these powerful jets are formed and sustained.

Continues to page 5

PrimeFocus

Cosmic Sprinkler Continued

The research team also identified moving termination shocks, where the jet violently collides with surrounding material, creating a shockwave. These shocks, the first recorded from an X-ray binary, provide further evidence of the jet's precession and offer a glimpse into the dynamic interactions between neutron stars and their environment.

Conclusion

The discovery of a "garden sprinkler-like" jet emanating from a neutron star has captivated the astronomical community. This unprecedented observation not only showcases the awe-inspiring power and complexity of these celestial objects but also paves the way for further research into the extreme physics governing their behavior.

As scientists continue to study this bizarre phenomenon, they hope to gain a deeper understanding of the mechanisms behind jet formation, the role of precession in neutron star systems, and the dynamic interactions between these stellar remnants and their surroundings. The cosmic sprinkler has opened a new window into the enigmatic world of neutron stars, promising to reveal even more secrets of these fascinating objects in the years to come.

OFFICERS AND VOLUNTEER POSITIONS

Officers	Club Star Party Coordinator Eric Dueltgen coordinator@trivalleystargazers.org	Night Sky Network Rep. Ross Gaunt nnsn@trivalleystargazers.org	Refreshment Coordinator OPEN
President Ron Kane president@trivalleystargazers.org	Del Valle Coordinator David Wright delvalle@trivalleystargazers.org	H2O Observatory Director / Rebuild Chairman Chuck Grant H2O@trivalleystargazers.org	Web and Email www.trivalleystargazers.org info@trivalleystargazers.org
Vice-President Eric Dueltgen vice_president@trivalleystargazers.org	Historian OPEN historian@trivalleystargazers.org	Observing Program Coordinator Ron Kane awards@trivalleystargazers.org	TVS E-Group To Join the TVS E-Group just send an email to TVS at info@trivalleystargazers.org asking to join the group. Make sure you specify the email address you want to use to read and post to the group.
Treasurer John Forrest treasurer@trivalleystargazers.org	Librarian Ron Kane librarian@trivalleystargazers.org	Outreach Coordinator Eric Dueltgen outreach@trivalleystargazers.org	
Secretary David Lackey secretary@trivalleystargazers.org	Loaner Scope Manager Ron Kane telescopes@trivalleystargazers.org	Potluck Coordinator OPEN potluck@trivalleystargazers.org	
Past President Roland Albers past_president@trivalleystargazers.org	Newsletter Scott Schneider (Editor) Saanika Kulkarni (Contributing Editor) newsletter@trivalleystargazers.org	Program Coordinator Dan Helmer programs@trivalleystargazers.org	
Volunteer Positions	Webmaster Swaroop Shere webmaster@trivalleystargazers.org	Publicity and Fundraising OPEN publicity@trivalleystargazers.org	
Astronomical League Rep. Don Dossa alrep@trivalleystargazers.org			

TVS ASTROPHOTOGRAPHY



NGC 6543, The Cat's Eye Nebula, by Scott Schneider
For a full resolution image see <https://www.astrobin.com/wiwlui/>

WHATS UP

Adapted from Sky & Telescope

All times are Pacific Standard Time

August 2024

19 Mon Full Moon

20 Tue Saturn and the moon, just one day past full, rise about $\frac{1}{4}^{\circ}$ apart.

26 Mon In the morning looking high in the east, Moon at last quarter and Pleiades are 3° apart

27 Tue In the morning see the waning crescent Moon, Jupiter, and Mars in the eastern sky about 5° apart.

30 Fri At dawn the waning crescent moon about 4° below Pollux while Caster is above.

September 2024

1 Sun Look east, about two hours before sunrise, for the next two weeks for the soft glow of the zodiacal light.

3 Tue New Moon

5 Thu Moon is $6\frac{1}{2}^{\circ}$ left of Venus low near the west-northwest horizon at dusk

7-8 Sat Looking in Aquarius, Saturn is at opposition all night

9 Mon At dawn Mercury is $1\frac{1}{2}^{\circ}$ to the left of Regulus while the rise together in the east-northeast

10 Tue Moon is about 6° left of Antares as they drop to the southwest horizon together.

11 Wed Moon is at first quarter

NAVIGATING THE NIGHT SKY FOR AUGUST

Navigating the mid August Night Sky

For observers in the middle northern latitudes, this chart is suitable for early August at 11 p.m. or late August 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.

Navigating the mid August 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 June evening sky.
- 3 To the northeast of Arcturus shines another star of the same brightness, Vega. Draw a line from Arcturus to Vega. It first meets "The Northern Crown," then the "Keystone of Hercules." A dark sky is needed to see these two dim stellar configurations.
- 4 High in the East lies the summer triangle stars of Vega, Altair, and Deneb.

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

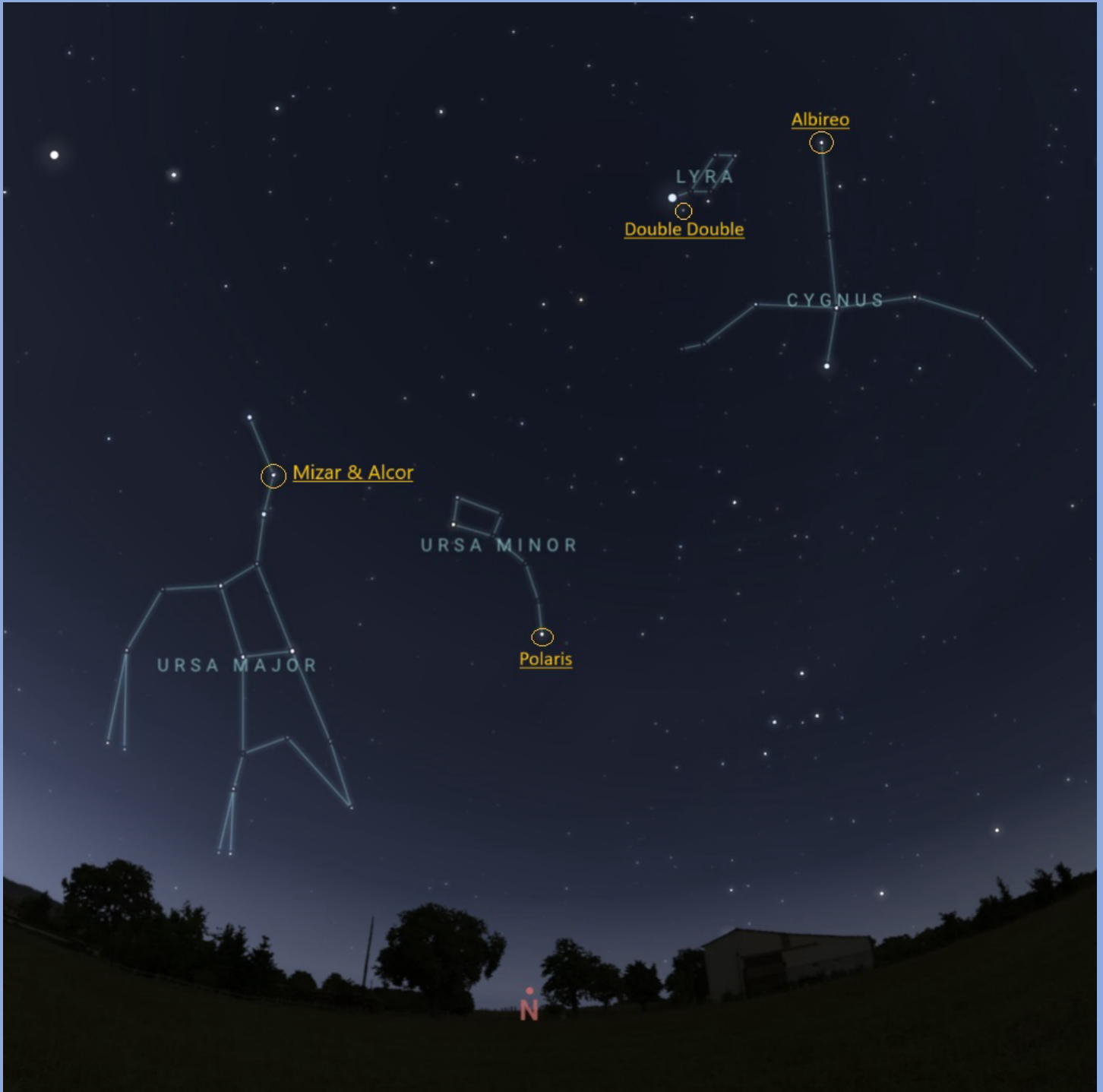
Download pdf here: <https://www.astroleague.org/wp-content/uploads/2024/07/2024-August.pdf>

NASA NIGHT SKY NOTES

Seeing Double

By Kat Troche

During the summer months, we tend to miss the views of Saturn, Jupiter and other heavenly bodies. But it can be a great time to look for other items, like globular star clusters such as Messier 13, open star clusters such as the Coma Star Cluster (Melotte 111), but also double stars!

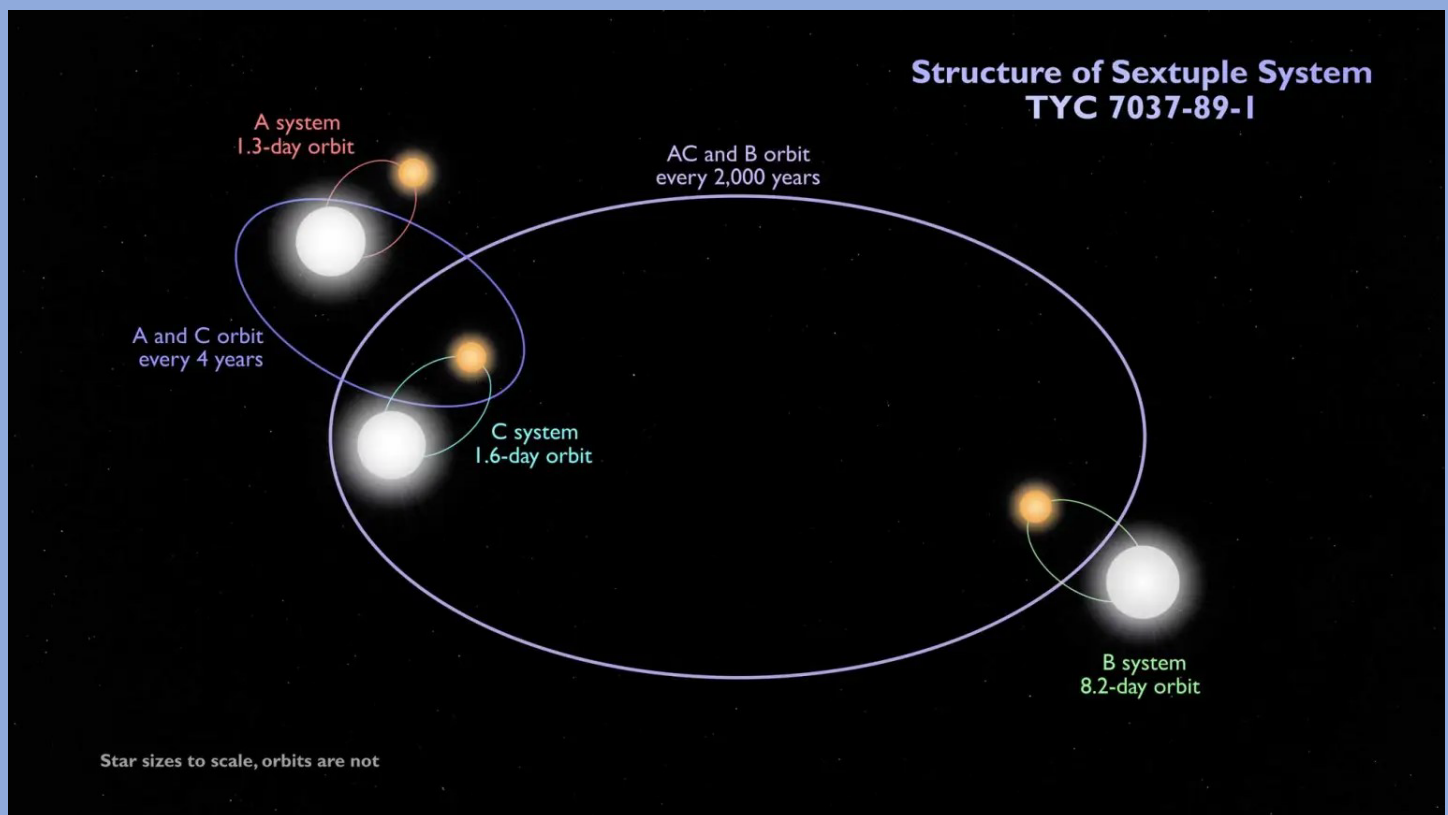


Mid-August night sky constellations with the following multiple star systems highlighted: the Double Double in Lyra, Albireo in Cygnus, Polaris in Ursa Minor, Mizar and Alcor in Ursa Major. Credit: Stellarium Web

What Are Double Stars?

If you have seen any movies or read any books that refer to having two suns in the sky, that would be a double star system. These star systems typically come in two types – binary and optical doubles. Binary stars are two stars that are gravitationally bound and orbit each other, and optical double stars only appear to be close together when viewed from Earth, but in reality, are extremely far apart from another, and are not affected by each other's gravity. With a small telescope, in moderately light polluted skies, summer offers great views of these stellar groupings from the Northern Hemisphere:

- **Double Double:** also known by its technical name, Epsilon Lyrae, this multiple star system appears as one star with naked eye observing. But with a small telescope, it can be split into 'two' stars. A large telescope reveals Epsilon Lyrae's secret – what looks like a single star is actually a quadruple star system!
- **Albireo:** a gorgeous double star set – one blue, one yellow – in the constellation Cygnus.
- **Polaris:** while technically a multiple star system, our North Star can easily be separated from one star to two with a modest telescope.
- **Mizar and Alcor:** located in the handle of the Big Dipper, this pair can be seen with the naked eye.



This schematic shows the configuration of the sextuple star system TYC 7037-89-1. The inner quadruple is composed of two binaries, A and C, which orbit each other every four years or so. An outer binary, B, orbits the quadruple roughly every 2,000 years. All three pairs are eclipsing binaries. The orbits shown are not to scale. Credit: NASA's Goddard Space Flight Center

Aside from looking incredible in a telescope or binoculars, double stars help astronomers learn about measuring the mass of stars, and about stellar evolution. Some stars orbit each other a little too closely, and things can become disastrous, but overall, these celestial bodies make for excellent targets and are simple crowd pleasers.

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

ADDITIONAL LINKS:

<https://science.nasa.gov/universe/stars/multiple-star-systems/>

<https://science.nasa.gov/universe/cosmic-couples-and-devastating-breakups/>



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!



Tri-Valley Stargazers
P.O. Box 2476
Livermore, CA 94551
www.trivalleystargazers.org

Tri-Valley Stargazers Membership Application

Contact information:

Name: _____ Phone: _____

Street Address: _____

City, State, Zip: _____

Email Address: _____

Status (select one): New member Renewing or returning member

Membership category (select one): Membership term is for one calendar year, January through December.

Student member (\$10). Must be a full-time high-school or college student.

Regular member (\$30).

Hidden Hill Observatory Access (optional): Must be 18 or older.

One-time key deposit (\$20). This is a refundable deposit for a key to H2O. New key holders must first hear an orientation lecture and sign a usage agreement form before using the observing site.

Annual access fee (\$10). You must also be a key holder to access the site.

Donation (optional):

Tax-deductible contribution to Tri-Valley Stargazers

Total enclosed: \$ _____

Member agrees to hold Tri-Valley Stargazers, and any cooperating organizations or landowners, harmless from all claims of liability for any injury or loss sustained at a TVS function. TVS will not share information with anyone except as detailed in our Privacy Policy (<http://www.trivalleystargazers.org/privacy.shtml>).

Mail this completed form along with a check to: Tri-Valley Stargazers, P.O. Box 2476, Livermore, CA 94551.