



BINARY STARS DR. CATHERINE A. CLARK

Dr. Catherine Clark began her academic journey at the University of Michigan, earning a dual Bachelor of Science in Astronomy and Astrophysics and Spanish.

In 2017, Dr. Catherine Clark relocated to Flagstaff, Arizona to pursue her PhD in Astronomy and Planetary Science at Northern Arizona University. Her dissertation research at Lowell Observatory focused on M-dwarf multiplicity and its impact on planetary system architectures and occurrence rates, utilizing high-resolution imaging under the guidance of Dr. Gerard van Belle. During this period, Dr. Clark also completed a Graduate Certificate in Science Communication.

In 2022, Dr. Catherine Clark moved to Pasadena, California to begin her position as a NASA Jet Propulsion Laboratory Postdoctoral Fellow. In this role, she worked with Dr. David Ciardi to characterize planets in multi-star systems, investigating how they differ from single-star systems like our own.



This artist's concept illustrates how tightly the three stars in the system called TIC 290061484 orbit each other. If they were placed at the center of our solar system, all the stars' orbits would be contained a space smaller than Mercury's orbit around the Sun. The sizes of the triplet stars and the Sun are also to scale. NASA's Goddard Space Flight Center. <https://www.nasa.gov/missions/tess/nasas-tess-spots-record-breaking-stellar-triplets/>

Currently, Dr. Clark serves as a Scientific Outreach Coordinator at the NASA Exoplanet Science Institute (NExSci). Her responsibilities include managing the partnership between NASA and Keck Observatory, organizing the Sagan summer workshop, facilitating the NASA Hubble Fellowship Program, and representing NExSci at conferences and online platforms.

Dr. Clark's research interests include binary star systems, exoplanet host stars, low-mass stars, and astronomical instrumentation.

Please note that Dr. Clark will be giving her presentation to the club this month in person. Please consider attending this month's meeting in person if you can.

WHEN

April 18, 2025
Doors open at 7:00pm
Meeting starts at 7:30pm
Lecture starts at 8:00pm

WHERE

Unitarian Church
1893 North Vasco Road
Livermore, CA 945571
and via Zoom

TVS QR CODE



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NEWS AND NOTES

Meeting Dates

Club Meeting	Board Meeting	PrimeFocus Deadline
April 18	April 21	April 6
May 18	May 21	May 6
June 20	June 23	June 6

Money Matters

As of the last Treasurer’s Report on 2/40/25, our club’s account balance is \$49,833.30, this includes \$12,569.51 in the H2O Rebuild fund.

TVS Welcomes New Members

TVS welcomes new members Sarath Dorbala, Nicholas Chu, Moustafa Aly, and Rajat Harjani. Please say hello and chat with them during our meetings.

2025 TVS Club Star Party Schedule

Save the dates for the 2025 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.

No events currently scheduled for Del Valle.

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.

April 19: Tesla Vintner's Star Party, 5143 Tesla Rd., Livermore. Set-up at 7:30pm, Observing 8:00-11:30pm.

June 21: Tesla Vintner's Star Party, 5143 Tesla Rd., Livermore. Set-up at 8:00pm, Observing 8:30-11:30pm.

July 19: Tesla Vintner's Star Party, 5143 Tesla Rd., Livermore. Set-up at 7:30pm, Observing 8:00-Midnight.

September 13: Tesla Vintner's Star Party, 5143 Tesla Rd., Livermore. Set-up at 6:30pm, Observing 7:00pm-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.

June 14: H2O Open House, 5:00pm caravan to H2O PROMPTLY leaves the corner of Mines and Tesla Rds., Livermore. Observing until 11:30pm. Meeting times are tentative.

August 16: H2O Open House, 5:00pm caravan to H2O PROMPTLY leaves the corner of Mines and Tesla Rds., Livermore. Observing until 11:30pm. Meeting times are tentative.

April 30: School star party at John Green Elementary, 3300 Antone Way, Dublin. Set-up 6:30pm, Observing from 7:30-9:30pm.

May 2: School star party at Murray Elementary, 8435 Davona Dr, Dublin. Set-up 6:345pm, Observing from 7:30-9:30pm



April 5, 2025 Cub Scout Pack 556 Astronomy Night Event at the Del Valle Arroyo Road Staging Area. Photo courtesy of Scott Schneider.

CALENDAR OF EVENTS

April 18, 19, 25, 26, May 2, 3, 9,10, 16, 17

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://chabotspace.org/events/events-listing/>
<https://eastbayastro.org/chabot-telescope-status/>

April 22, 7:15 PM - 9:15 PM

What	Astronomy Lecture: Vera C. Rubin Observatory
Who	Mt. Diablo Astronomical Society
Where	Lindsay Wildlife Experience, 1931 1st Ave · Walnut Creek, CA
Cost	Free

Please join the Mt. Diablo Astronomical Society for our April 22 general meeting featuring Professor Steven Kahn, UC Berkeley, who will discuss the Vera C. Rubin Observatory, a large-aperture, wide-field telescope designed to produce imaging surveys of the entire southern hemisphere of sky every few nights. Over 10 years of operation, the Observatory will obtain roughly 1,000 images of every part of the southern sky. Comparing the images will help detect everything that changes in brightness as well as everything that moves in the sky. Kahn was director of the observatory's construction.

The meeting starts with a short “What's Up?” presented by MDAS member René Gandolfi, who will discuss the biography of Edmund Halley.

For more information, see
https://www.meetup.com/a-a-n-c/events/307171386/?eventOrigin=group_upcoming_events

April 26-27, 10:00 AM - 4:00 PM

What	From Oakland to the Stars: A weekend celebration of our new exhibit, Universe Unveiled
Who	Chabot Staff
Where	Chabot Space and Science Center, 10000 Skyline Blvd. Oakland, CA 94619
Cost	Adults (12+): \$24 Children (2-12) 7 Seniors (65+): \$19

Join us for a weekend full of hands-on discovery and community connection as we unveil our newest outdoor exhibit, Universe Unveiled, on the Observation Deck. From stunning space images to student-engineered rovers and hikes through the redwoods—there's something for everyone!

Developed in partnership with Space Telescope Science Institute, Universe Unveiled features a breathtaking gallery of astrophotography taken by amateur astrophotographers right here in the Bay Area. These aren't just beautiful images—they're windows into space, created with real scientific data and artistic insight that offer views into the sky above us.

This exhibit invites you to journey through time and technology, from early telescope sketches and glass plate photos to stunning modern images captured by passionate local

astrophotographers.

For more information, see
<https://chabotspace.org/calendar/from-oakland-to-the-stars-observation-deck-grand-reopening-26th/>

May 5, 7:30 PM

What	Astronomy Lecture: Finding and Understanding Exoplanets
Who	California Academy of Sciences
Where	Morrison Planetarium; 55 Music Concourse Drive, San Francisco, CA 94118
Cost	Public: \$15; Members and seniors: \$12

Featuring Dr. Douglas Caldwell, SETI Institute

In the past 30 years the study of exoplanets, or planets orbiting stars other than the Sun, has grown from an obscure area of science to one that now has engages thousands of astronomers, planetary scientists, geologists, chemists, and biologists and holds top billing in national and international conferences. Exoplanet research now commands a significant fraction of time on US and international ground-based and space-based observatories and is driving the design plans for NASA's and Europe's next multi-billion dollar missions. In this talk, we will discuss the tremendous growth in exoplanet research as witnessed by Dr. Caldwell through his work on missions that discovered more than two-thirds of the currently known planets. We will learn about the techniques used to find exoplanets, what scientists are learning about them as we move from an era of discovery to one of understanding, and about future plans to search for life on these small worlds.

Dr. Douglas Caldwell is a research scientist at the SETI Institute and chair of the Institute's Exoplanet research group. He received a BS in Physics from Carnegie-Mellon University and a Ph.D. from Rensselaer Polytechnic Institute. He began studying exoplanets as a Postdoctoral Fellow at the NASA Ames Research Center before joining the SETI Institute. He served as the Instrument Scientist for NASA's Kepler Mission and is currently a Pipeline Scientist for the Transiting Exoplanet Survey Satellite (TESS) Mission, helping to discover thousands of planets orbiting distant stars. He specializes in optical CCD instrument definition, design, testing, characterization, and calibration. He uses his data analysis expertise on a range of projects, including automated flight planning for Earth-observing aircraft and using machine learning to increase the speed and accuracy of exoplanet detections.

For more information, see
<https://www.calacademy.org/events/benjamin-dean-astronomy-lectures/finding-and-understanding-exoplanets>

TVS ASTROPHOTOGRAPHY



IC 443, the Jellyfish Nebula, By Kevin McLoughlin.

Shot with an OSC camera using an L-ultimate Ha/Oiii filter for 8 hours' integration time and rendered with the "foraxx" palette. The Jellyfish is a supernova remnant in Gemini in which the expanding shells of hydrogen and oxygen are colliding with surrounding gas and dust clouds, leading to all the interesting structure we see here. For a full resolution image see <https://app.astrobin.com/u/kmcloughlin?i=whkj6g#gallery>



IC2177 the Dawn Chorus, By Tri Do.

A section of IC2177 Seagull Nebula in narrowband including H-beta. The sound of a flock of birds in the morning is sometimes poetically called a dawn chorus. For a full resolution image see https://app.astrobin.com/u/oddirt_cosmos?i=nafmwy



IC 1795 Fish Head, By Tri Do.

IC 1795 Fish Head in three narrowband palettes with H-beta and two crops: Foraxx, SHO, and naturalistic (filter spectra mapped to RGB color space). RGB filters comprised the stars. For a full resolution image see https://app.astrobin.com/u/oddirt_cosmos?i=j7y94f

WHATS UP

Adapted from Sky and Telescope

All times are Pacific Standard Time

April 2025

21	Mon	Moon at last quarter
21-22	Mon-Tue	Lyrid meteor shower peaks
24	Thu	Venus is low in the east at dawn
25	Fri	Crescent moon, Venus and Saturn from a triangle low in the east at dawn
27	Sun	New Moon
28	Mon	At dusk the waxing crescent moon leads the Pleiades by $4\frac{1}{2}^\circ$ as the sunsets in the west
30	Wed	At dusk moon is $6\frac{1}{2}^\circ$ above Jupiter

May 2025

1	Thu	Venus and Saturn about 4° apart low in the east at dawn
2	Fri	Facing west at dusk the moon is 2° lower left of Pollux
3	Sat	Moon is $1\frac{1}{2}^\circ$ above Mars in Cancer
4	Sun	Moon is at first quarter
5	Mon	At dusk moon is about 3° left of Regulus
10	Sat	In the morning the waxing gibbous moon is about 1° below Spica
12	Mon	Full Moon
13	Tue	Look east in the evening Moon and Antares rising in tandem are about $\frac{1}{2}^\circ$ apart

OFFICERS AND VOLUNTEER POSITIONS

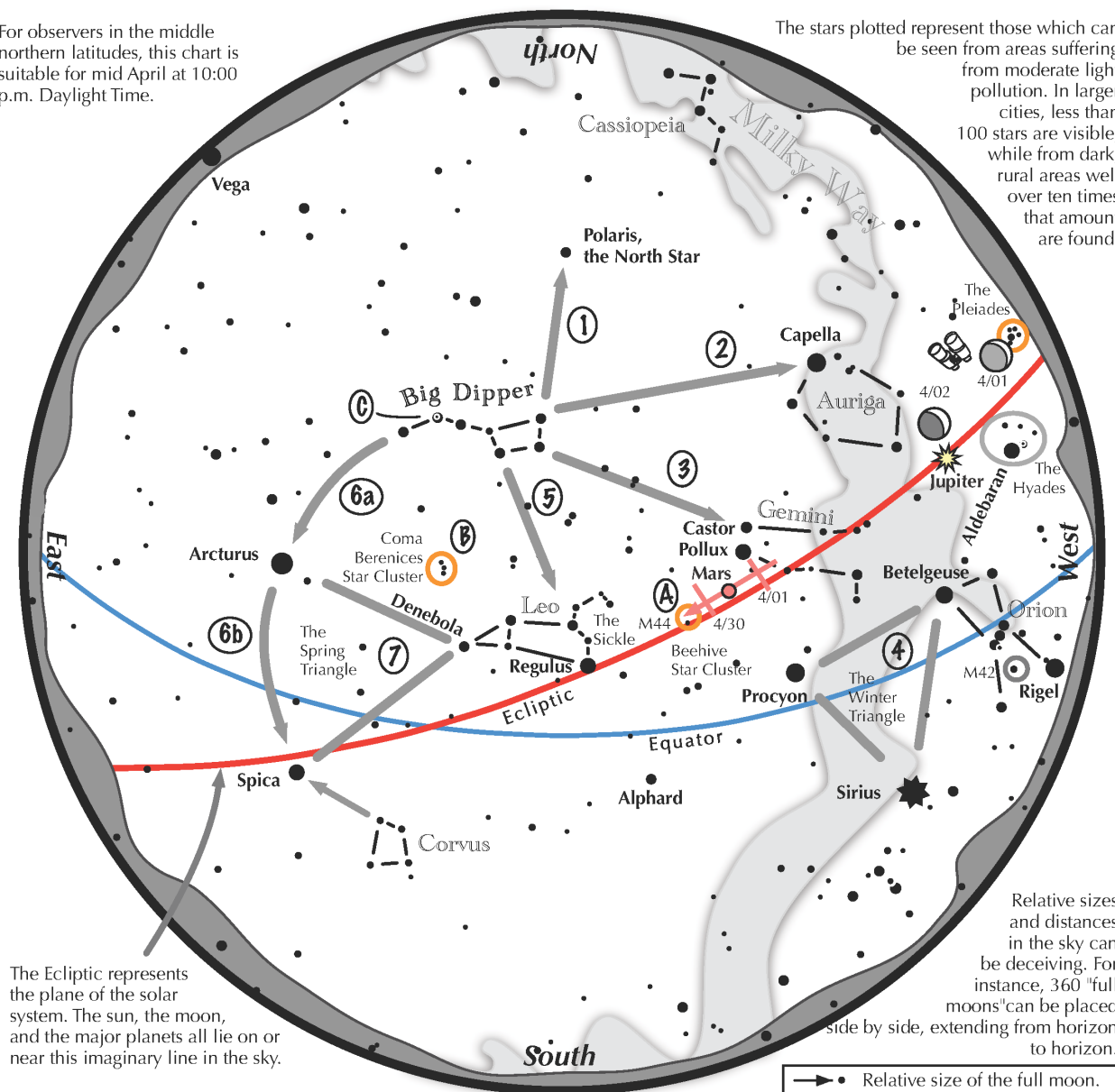
Officers	Volunteer Positions	Newsletter	Potluck Coordinator
President Eric Dueltgen president@trivalleystargazers.org	Astronomical League Rep. Don Dossa alrep@trivalleystargazers.org	Scott Schneider (Editor) newsletter@trivalleystargazers.org	OPEN potluck@trivalleystargazers.org
Vice-President Aris Pope vice_president@trivalleystargazers.org	Club Star Party Coordinator Johnathan Bailey coordinator@trivalleystargazers.org	Webmaster Swaroop Shere webmaster@trivalleystargazers.org	Program Coordinator Ron Kane programs@trivalleystargazers.org
Treasurer John Forrest treasurer@trivalleystargazers.org	Del Valle Coordinator David Wright delvalle@trivalleystargazers.org	Night Sky Network Rep. Ross Gaunt nnsn@trivalleystargazers.org	Publicity and Fundraising OPEN publicity@trivalleystargazers.org
Secretary Dave Lackey secretary@trivalleystargazers.org	Historian OPEN historian@trivalleystargazers.org	H2O Observatory Director / Rebuild Chairman Chuck Grant H20@trivalleystargazers.org	Refreshment Coordinator OPEN
Past President Ron Kane past_president@trivalleystargazers.org	Librarian Ron Kane librarian@trivalleystargazers.org	Observing Program Coordinator Ron Kane awards@trivalleystargazers.org	Web and Email www.trivalleystargazers.org info@trivalleystargazers.org
	Loaner Scope Manager Ron Kane telescopes@trivalleystargazers.org	Outreach Coordinator Johnathan Bailey outreach@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.

NAVIGATING THE NIGHT SKY FOR APRIL 2025

Navigating the April Night Sky, Northern Hemisphere

For observers in the middle northern latitudes, this chart is suitable for mid April at 10:00 p.m. Daylight Time.

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 April night sky: Simply start with what you know or with what you can easily find.

- 1 Extend an imaginary line north from the two stars at the tip of the Big Dipper's bowl. It passes Polaris, the North Star.
- 2 Draw another imaginary line west across the top two stars of the Dipper's bowl. It strikes Capella low in the northwest.
- 3 Through the two diagonal stars of the Dipper's bowl, draw a line pointing to the twin stars of Castor and Pollux in Gemini.
- 4 Look in the west-southwest for the bright Winter Triangle stars of Sirius, Procyon, and Betelgeuse.
- 5 Directly below the Dipper's bowl reclines the constellation Leo with its primary star, Regulus.
- 6 Follow the arc of the Dipper's handle. It first intersects Arcturus, then continues to Spica.
- 7 Arcturus, Spica, and Denebola form the Spring Triangle, a large equilateral triangle.

Binocular Highlights

- A: M44, a star cluster barely visible to the naked eye, lies to the southeast of Pollux.
 B: Look nearly overhead for the loose star cluster of Coma Berenices.
 C: In the Big Dipper's handle shines Mizar next to a dimmer star, Alcor.



Astronomical League
www.astroleague.org

Duplication allowed and encouraged for all free distribution.

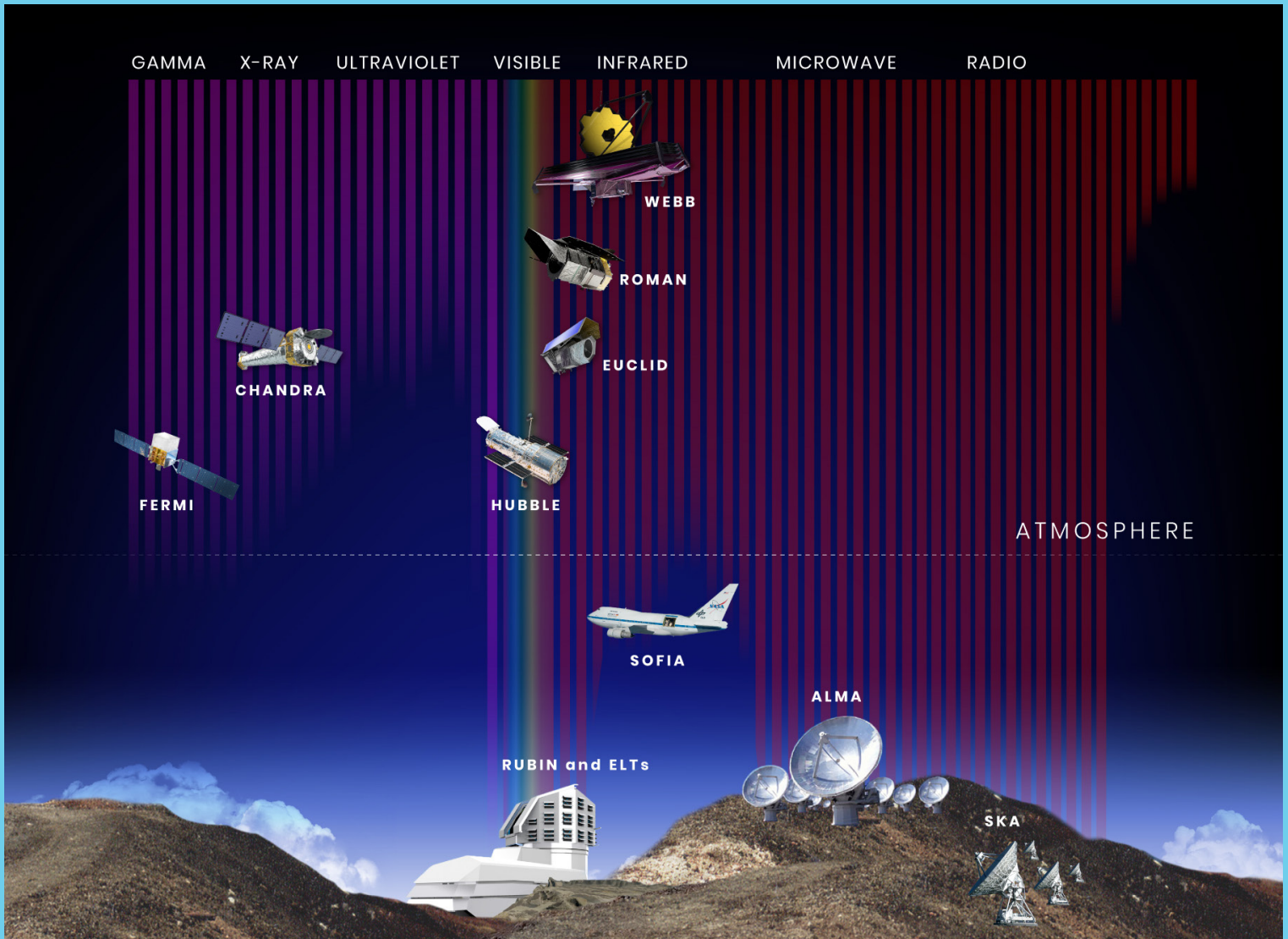
NASA NIGHT SKY NOTES

Catch the Waves!

By Kat Troche

The Electromagnetic Spectrum

If you've ever heard the term "radio waves," used a microwave or a television remote, or had an X-ray, you have experienced a broad range of the electromagnetic spectrum! But what is the electromagnetic spectrum? According to Merriam-Webster, this spectrum is "the entire range of wavelengths or frequencies of electromagnetic radiation extending from gamma rays to the longest radio waves and including visible light." But what does that mean? Scientists think of the entire electromagnetic spectrum as many types of light, only some that we can see with our eyes. We can detect others with our bodies, like infrared light, which we feel as heat, and ultraviolet light, which can give us sunburns. Astronomers have created many detectors that can "see" in the full spectrum of wavelengths.



This illustration shows the wavelength sensitivity of a number of current and future space- and ground-based observatories, along with their position relative to the ground and to Earth's atmosphere. The wavelength bands are arranged from shortest (gamma rays) to longest (radio waves). The vertical color bars show the relative penetration of each band of light through Earth's atmosphere. Credit: NASA, STScI

Telescope Types

While multiple types of telescopes operate across the electromagnetic spectrum, here are some of the largest, based on the

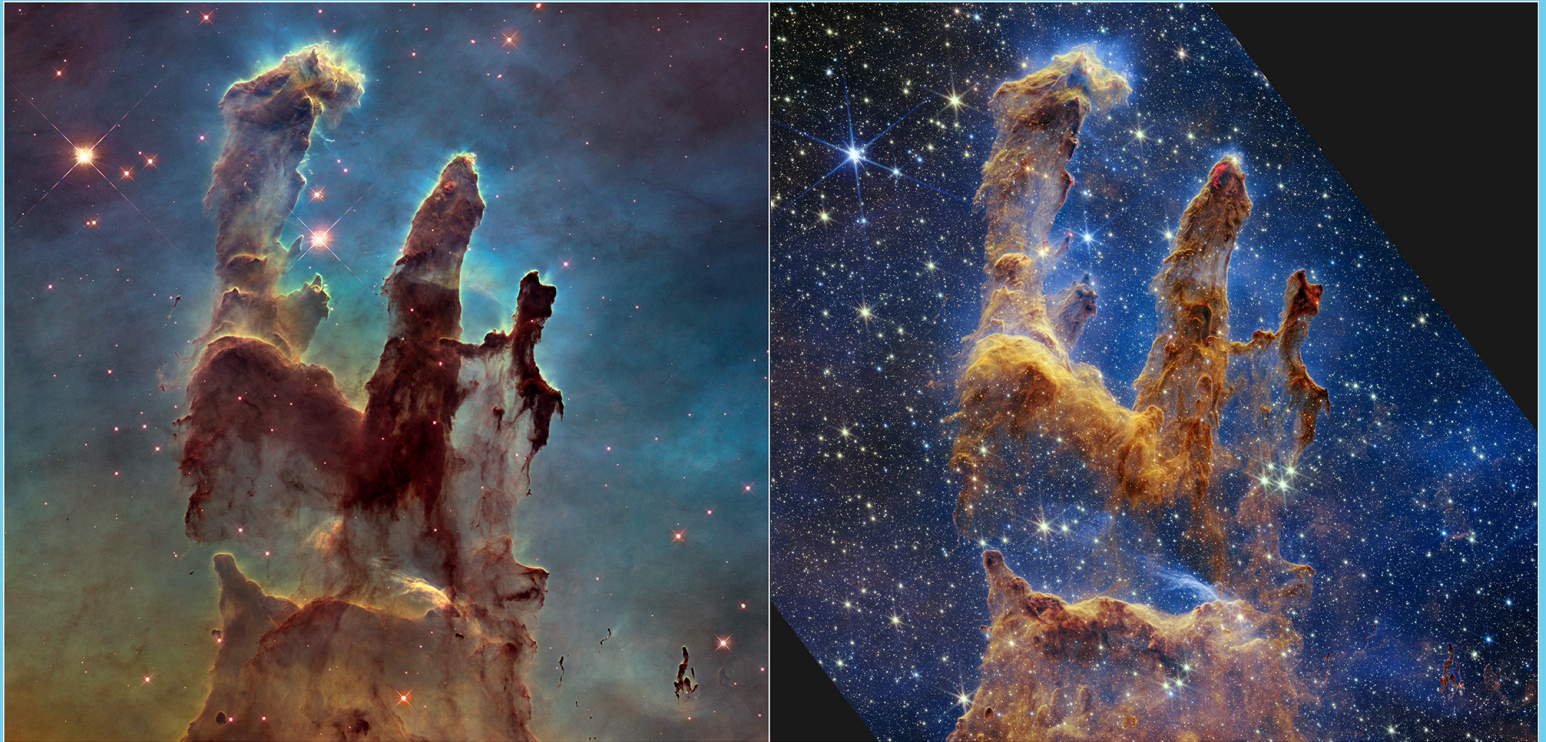
Catch the Waves continues to page 8

PrimeFocus

Catch the Waves continued

wavelength they primarily work in:

- **Radio:** probably the most famous radio telescope observatory would be the Very Large Array (VLA) in Socorro County, New Mexico. This set of 25-meter radio telescopes was featured in the 1997 movie *Contact*. Astronomers use these telescopes to observe protoplanetary disks and black holes. Another famous set of radio telescopes would be the Atacama Large Millimeter Array (ALMA) located in the Atacama Desert in Chile. ALMA was one of eight radio observatories that helped produce the first image of supermassive black holes at the center of M87 and Sagittarius A* at the center of our galaxy. Radio telescopes have also been used to study the microwave portion of the electromagnetic spectrum.
- **Infrared:** The James Webb Space Telescope (JWST) operates in the infrared, allowing astronomers to see some of the earliest galaxies formed nearly 300 million years after the Big Bang. Infrared light allows astronomers to study galaxies and nebulae, which dense dust clouds would otherwise obscure. An excellent example is the Pillars of Creation located in the Eagle Nebula. With the side-by-side image comparison below, you can see the differences between what JWST and the Hubble Space Telescope (HST) were able to capture with their respective instruments.



NASA's Hubble Telescope captured the Pillars of Creation in 1995 and revisited them in 2014 with a sharper view. Webb's infrared image reveals more stars by penetrating dust. Hubble highlights thick dust layers, while Webb shows hydrogen atoms and emerging stars. You can find this and other parts of the Eagle Nebula in the Serpens constellation. Credit: NASA, ESA, CSA, STScI, Hubble Heritage Project (STScI, AURA)

- **Visible:** While it does have some near-infrared and ultraviolet capabilities, the Hubble Space Telescope (HST) has primarily operated in the visible light spectrum for the last 35 years. With over 1.6 million observations made, HST has played an integral role in how we view the universe. Review Hubble's Highlights at the link listed below.
- **X-ray:** Chandra X-ray Observatory was designed to detect emissions from the hottest parts of our universe, like exploding stars. X-rays help us better understand the composition of deep space objects, highlighting areas unseen by visible light and infrared telescopes. This image of the Crab Nebula combines data from five different telescopes: The VLA (radio) in red; Spitzer Space Telescope (infrared) in yellow; Hubble Space Telescope (visible) in green; XMM-Newton (ultraviolet) in blue; and Chandra X-ray Observatory (X-ray) in purple. You can view the breakdown of this multiwavelength image [here](#).

Try This At Home

Catch the Waves continues to [page 9](#)

PrimeFocus

Catch the Waves continued

Even though we can't see these other wavelengths with our eyes, learn how to create multiwavelength images with the Cosmic Coloring Compositor activity and explore how astronomers use representational color to show light that our eyes cannot see with our Clues to the Cosmos activity.



The Crab Nebula, located in the Taurus constellation, is the result of a bright supernova explosion in the year 1054, 6,500 light-years from Earth. Credit: X-ray: NASA/CXC/SAO; Optical: NASA/STScI; Infrared: NASA/JPL/Caltech; Radio: NSF/NRAO/VLA; Ultraviolet: ESA/XMM-Newton

Additional Links

Electromagnetic Spectrum: <https://www.nasa.gov/directorates/somd/space-communications-navigation-program/spectrum-overview/>

Hubble's Highlights: <https://science.nasa.gov/mission/hubble/science/science-highlights/>

Cosmic Coloring Compositor: <https://public.nrao.edu/color/>

Clues to the Cosmos: <https://nightsky.jpl.nasa.gov/documents/756/CluesCosmosHandouts.pdf>



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.