

PrimeFocus

February 2024



THE SEARCH FOR (ALMOST) STARLESS GALAXIES DR. LUKE LEISMAN

Are there galaxies that we can't see? The ALFALFA survey used Arecibo Observatory, the largest radio telescope in the world before its collapse, to search for radio waves from hidden, starless galaxies. What else is out there? This talk will present results from this (almost) dark galaxy harvest, and explore what they teach us about how galaxies form.

WHEN:

February 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



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This Hubble Space Telescope snapshot reveals an unusual "see-through" galaxy. The giant cosmic cotton ball is so diffuse and its ancient stars so spread out that distant galaxies in the background can be seen through it. Called an ultra-diffuse galaxy, this galactic oddball is almost as wide as the Milky Way, but it contains only 1/200th the number of stars as our galaxy. The ghostly galaxy doesn't appear to have a noticeable central region, spiral arms, or a disk. Researchers calculated a more accurate distance to the galaxy, named NGC 1052-DF2, or DF2, by using Hubble to observe about 5,400 aging red giant stars. Red giant stars all reach the same peak brightness, so they are reliable yardsticks to measure distances to galaxies. The research team estimates that DF2 is 72 million light-years from Earth. They say the distance measurement solidifies their claim that DF2 lacks dark matter, the invisible glue that makes up the bulk of the universe's contents. The galaxy contains at most 1/400th the amount of dark matter that the astronomers had expected. The observations were taken between December 2020 and March 2021 with Hubble's Advanced Camera for Surveys. SCIENCE: NASA, ESA, STScI, Zili Shen (Yale), Pieter van Dokkum (Yale), Shany Danieli (IAS) IMAGE PROCESSING: Alyssa Pagan (STScI)
<https://hubblesite.org/contents/media/images/2018/16/4139-Image.html?news=true>

Dr. Luke Leisman is an astronomer and author, deeply curious about the world, and committed to making it a better place. Currently a research professor and administrator at the University of Illinois, Dr. Leisman received his PhD from Cornell University and BS from Calvin University. His research focuses on radio waves from "hidden" galaxies, and understanding the things of the universe we can't see.

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The Search For (Almost) Starless Galaxies, continued

In addition to academic work, Dr. Leisman maintains a [blog on astronomy's place in our lives](#), and enjoys music, kayaking, and hanging out with friends

NEWS AND NOTES

2024 Meeting Dates

Club Meeting	Board Meeting	PrimeFocus Deadline
Feb. 16	Feb. 19	
Mar. 15	Mar. 18	Mar. 1
Apr. 15	Apr. 19	Apr. 5

Money Matters

As of the last Treasurer's Report on 1/22/24, our club's account balance is \$59,861.20. This includes \$26,145.47 in the H2O Rebuild fund.

TVS Welcomes New Members

TVS welcomes new members Ravneet Julka, Imran Badr, Adam Bertsch, Teresa Hegarty, Ravi Valmikam, Manish Patil, and Orlando Trejo. Please say hello and chat with them during our meetings.

2024 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. The public is invited for the first 1.5-2 hours, while club members can stay the remainder of the night.

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.

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.

February 21: School star party at Jackson Avenue Elementary School, 554 Jackson Avenue in Livermore. Set up 5:00, observing 6:00 to 8:00, in conjunction with their family science night.

February 22: School star party at Hart Middle School in Pleasanton. Set up 6:00 pm, start observing 6:45 pm.

February 29: School star party at Arroyo Seco Elementary School, 5280 Irene Way, Livermore. In conjunction with their family engineering night. The event goes from 5:30 to 7:30, so we plan to set up about 5:00, even though sunset is about 6:00. We want to be set up before the crowds get there.

March 14: Indoor astronomy related activities at Frederiksen's Pi Day celebration and STEM fair. Set up about 4:30 pm. The event goes from 5:00 to 8:00. Sunset is about 7:15 and moon phase is favorable, so we may try to set up a telescope or two about 7:00.

CALENDAR OF EVENTS

February 16, 17, 23, 24, March 1, 2, 8, 9, 15, 16, 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/>

February 20, 7:30 PM

What	Beginner Astrophotography – My Journey and Learnings
Who	SJAA
Where	Online
Cost	Free

Featuring our very own Imran Badr
Imran Badr started deep-sky astrophotography in late 2022. Within a short span of time, he has created some detailed images of bright and faint objects. During this

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presentation, Imran will dive deep into his journey, learnings along the way, and things to consider when capturing data and processing images. This presentation will be particularly useful for astrophotographers who are just starting out in this hobby and want to learn a few tips and tricks.

For more information, see:
<https://www.meetup.com/sj-astronomy/events/294830070/>

March 4, 7:30 PM

What NASA Spacecraft Swarms for Low Earth Orbit and Beyond
Who California Academy of Sciences
Where Morrison Planetarium; 55 Music Concourse Drive, San Francisco, CA 94118
Cost Public: \$15; Members and seniors: \$12

Featuring Scott Miller, NASA/Ames Research Center
Humanity's future in space will depend on autonomous robotic spacecraft, whether in orbit around Earth or exploring the far reaches of our solar system. Spacecraft swarms, or groups of autonomous cooperative spacecraft, have the potential to revolutionize future

space exploration and science missions. In 2023, NASA's Starling project launched a team of four satellites to test swarm technologies in orbit around Earth. Additionally, Starling will be exploring advanced space traffic management techniques to cope with an increasingly crowded Low Earth Orbit environment. Nicknamed Inky, Pinky, Blinky, and Clyde, these robotic spacecraft are paving the way for a future in which telescopes can be as large as a planet, hundreds of autonomous spacecraft can coordinate to map the Solar System, and thousands of satellites can sustainably orbit Earth to benefit humanity.

For more information, see:
<https://www.calacademy.org/events/benjamin-dean-astronomy-lectures/nasa-spacecraft-swarms-for-low-earth-orbit-and-beyond>

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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.

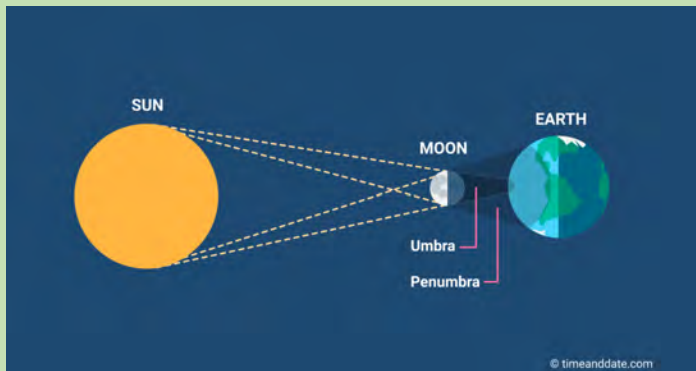
THE SOLAR ECLIPSE OF 2024: WHAT TO EXPECT; SAANIKA KULKARNI

As you may have heard, on April 8, 2024, a total solar eclipse will be visible across most of the continental U.S! In this article, we'll be discussing what to expect and look for on the much-anticipated day and how solar eclipses work.

How do Solar Eclipses Work?

Solar eclipses are mesmerizing celestial events that occur when the Moon passes directly between the Earth and the Sun, temporarily blocking the Sun's light. The alignment of these three celestial bodies is a rare and precise occurrence due to their orbits. The Moon's orbit around Earth is slightly tilted relative to Earth's orbit around the Sun. However, there are specific points where these orbital planes intersect, called nodes.

Total solar eclipses happen when the Moon is at one of its nodes, and Earth, the Moon, and the Sun form a straight line, known as syzygy. This alignment causes the Moon's shadow to be cast on Earth, creating the phenomenon we observe as a solar eclipse.



If you're located in the umbra, you will experience a total solar eclipse. If you're in the penumbra, you will experience a partial eclipse. Credit: Time and Date

There are two key components to the Moon's shadow during a solar eclipse: the penumbra and the umbra. The penumbra is the outer, lighter part of the shadow, where only a portion of the Sun is obscured, resulting in a partial eclipse for observers in that region. The umbra, on the other hand, is the inner, darker part of the shadow, where the Sun is entirely blocked, leading to the much-anticipated total eclipse within that specific path. The apparent sizes of the Moon and the Sun play a crucial role in the occurrence of total solar eclipses. Although the Sun is significantly larger than the Moon, it is also much farther away. From the perspective of Earth, the Moon can appear to be almost the same size as the Sun, allowing it to perfectly cover the solar disk during a total eclipse.

2024 Eclipse



The path of the eclipse on April 8th, 2024. Credit: NASA

There are a lot of cool phenomena that occur during solar eclipses; for instance, if you're in the path of totality, there's a super rare but beautiful phenomenon that can occur: Baily's Beads. As the Moon aligns perfectly between the Earth and the Sun during the initial stages of totality, the rugged lunar landscape creates a breathtaking display of light and shadow. Sunlight, streaming through the lunar valleys and around its uneven edges, momentarily forms a series of brilliant beads of light along the lunar limb. These beads, known as Baily's Beads, manifest as shimmering points of brilliance resembling a string of luminous pearls. The phenomenon reaches its pinnacle just before the complete coverage of the solar disk, culminating in the mesmerizing "Diamond Ring Effect" as the final bead of light fades, marking the onset of the enchanting totality phase during a solar eclipse.

Safety During a Solar Eclipse



Baily's Beads. Credit: Britannica

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Even if you're in the path of totality, it's super important to remember to be safe during a solar eclipse. Usually, we see the photosphere of the sun. However, during the fleeting moments of totality, as the Moon perfectly aligns, a rare revelation occurs – the unveiling of the corona layer. Unlike the photosphere, the corona is a faint, pearly halo of ionized gases that extends far into space, showcasing the Sun's outer atmosphere. Looking directly at the Sun's corona during a solar eclipse or any other time is hazardous to the eyes due to the intense brightness and harmful radiation emitted by the Sun. The corona is much dimmer than the Sun's surface, the photosphere, but it still contains a substantial amount of ultraviolet (UV) and infrared radiation. These forms of radiation can cause severe damage to the sensitive tissues of the eyes, including the cornea and the retina. It may seem tempting

to remove your solar eclipse glasses to view the sun's corona, but you're the safest when you're wearing your glasses, even if you don't notice any damage to your eye after viewing.

Speaking of solar eclipse glasses, it's also very important to make sure they're safe and certified. Here's a link to a list of certified vendors published by the American Astronomical Society: <https://eclipse.aas.org/eye-safety/viewers-filters>. Overall, the upcoming total solar eclipse on April 8, 2024, promises an extraordinary celestial display that captivates both seasoned astronomers and casual sky gazers alike. I'll be sure to write an article about my experience and include my pictures in April!

TVS ASTROPHOTOGRAPHY



M45, by John Barclay

6.6 hr total integration time (531 – 45s exp), ZWO ASI294MC Pro Camera, 6" GSO F4 Astrograph Telescope



Melotte 15 SHO with RGB Stars, by Imran Badr

<https://www.astrobin.com/prky6v/0/>

WHATS UP

Adapted from Sky & Telescope

All times are Pacific Standard Time

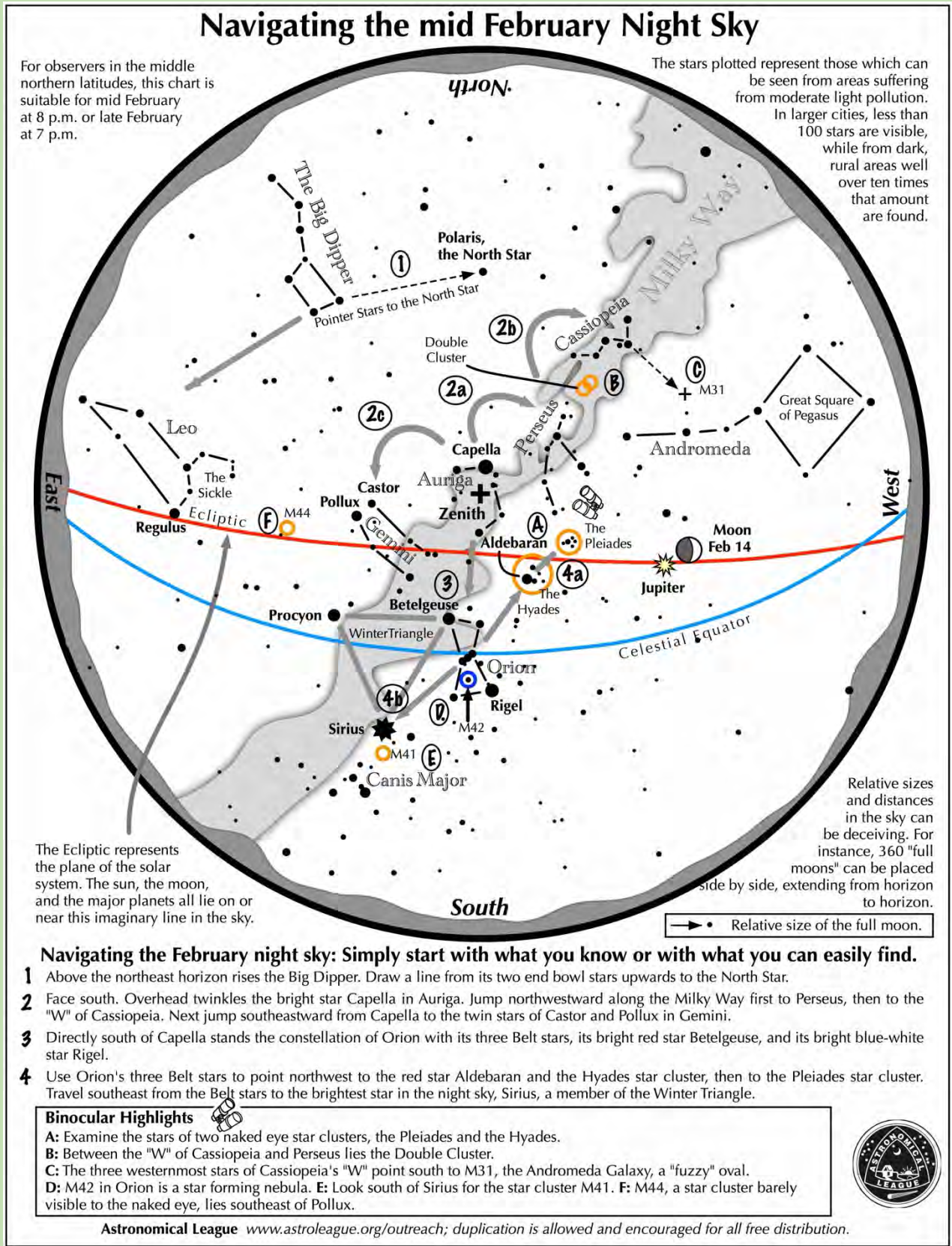
February

- 16 Fri Moon at first quarter
- 18 Sun Algol is at minimum brightness for approximately 2 hours centered around 6:21pm
- 20 Tue Moon about 1.5° lower right of Pollux high in the sky after sunset
- 22 Thu Mars and Venus just 0.5° apart very low in the East-Southeastern dawn sky.
- 23 Fri Full Moon**
- 28 Wed Waning Gibbous moon about 1.5° right of Spica in the Southwestern sky at dawn

March

- 3 Sun Moon at last quarter
- 6 Wed Algol is at minimum brightness for approximately 2 hours centered around 10:17pm
- 9 Sat Algol is at minimum brightness for approximately 2 hours centered around 7:07pm
- 10 Sun Daylight Saving Time starts at 2:00am
- 10 Sun New Moon**
- 13 Wed Moon is 3° above Jupiter high in the west
- 14 Thu Moon is 1.5° below the Pleiades

NAVIGATING THE NIGHT SKY FOR FEBRUARY



NASA NIGHT SKY NOTES

Constant Companions: Circumpolar Constellations, Part I

By Kat Troche

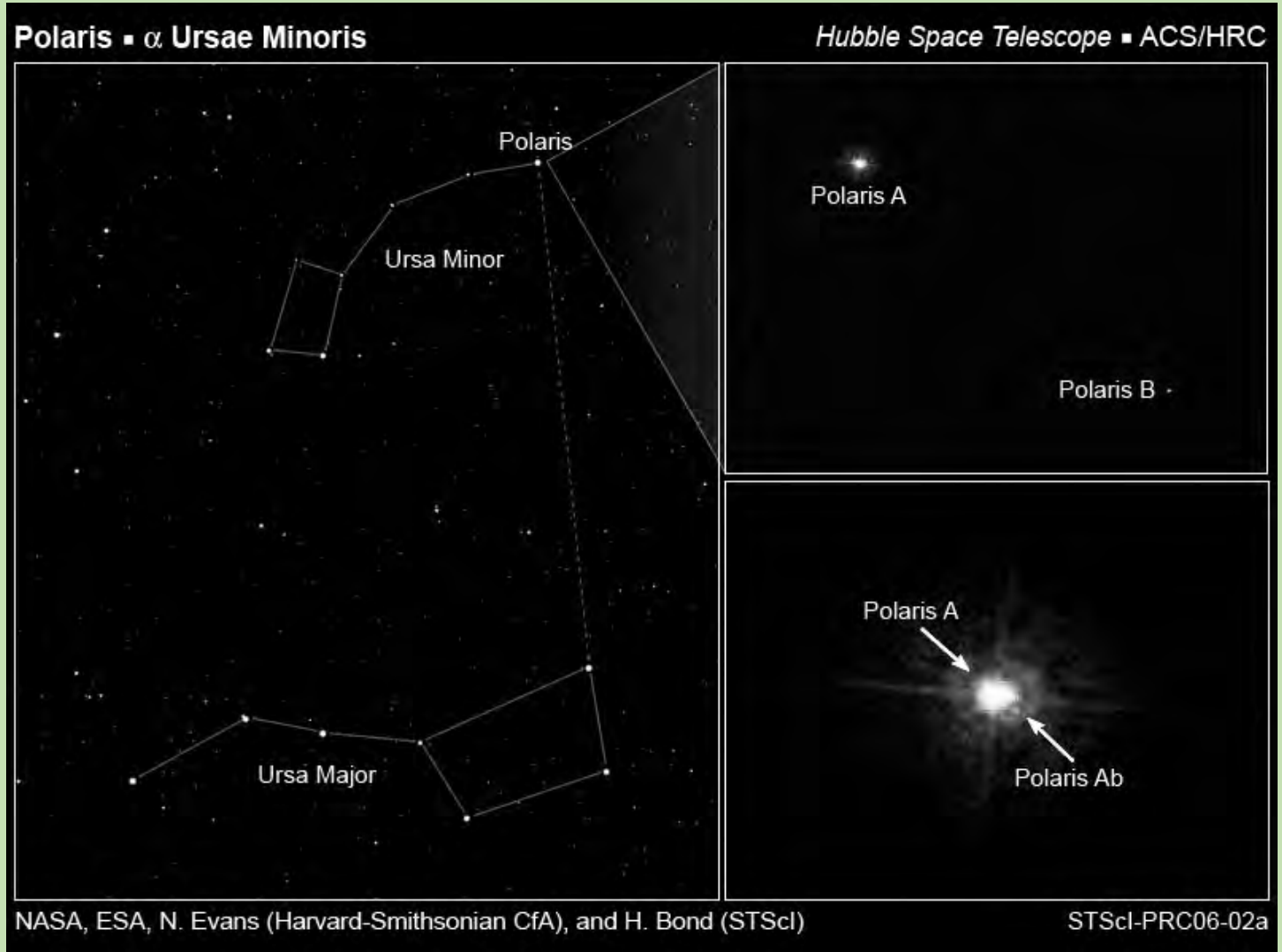
Winter in the northern hemisphere offers crisp, clear ([and cold!](#)) nights to stargazers, along with better views of several circumpolar constellations. What does circumpolar mean when referring to constellations? This word refers to constellations that surround the north and south celestial poles without ever falling below the horizon. Depending on your latitude, you will be able to see up to nine circumpolar constellations in the northern hemisphere. Today, we'll focus on three that have gems within: Auriga, Cassiopeia, and Ursa Minor. These objects can all be spotted with a pair of binoculars or a small to medium-sized telescope.



The counterclockwise circumpolar constellations Auriga, Cassiopeia, and Ursa Minor in the night sky, with four objects circled in yellow labeled: Pinwheel Cluster, Starfish Cluster, Owl Cluster, and Polaris.

Credit: Stellarium Web

- **The Pinwheel Cluster:** Located near the edge of Auriga, this open star cluster is easy to spot with a pair of binoculars or small telescope. At just 25 million years old, it contains no red giant stars and looks similar to the Pleiades. To find this, draw a line between the stars Elnath in Taurus and Menkalinan in Auriga. You will also find the Starfish Cluster nearby.
- **The Owl Cluster:** Located in the 'W' or 'M' shaped constellation Cassiopeia, is the open star cluster known as the Owl Cluster. Sometimes referred to as the E.T. Cluster or Dragonfly Cluster, this group of stars never sets below the horizon and can be spotted with binoculars or a small telescope.



A black and white image from the Hubble Telescope of the Polaris star system, showing three stars: Polaris A, Ab, and Polaris B.
Credit: NASA, ESA, N. Evans (Harvard-Smithsonian CfA), and H. Bond (STScI)

- Polaris: Did you know that [Polaris is a triple star system](#)? Look for the North Star on the edge of Ursa Minor, and with a medium-sized telescope, you should be able to separate two of the three stars. This star is also known as a [Cepheid variable star](#), meaning that it varies in brightness, temperature and diameter. It's the closest one of its kind to Earth, making it a great target for study and [conceptual art](#).

Up next, catch the King of the Planets before its gone for the season with our upcoming mid-month article on the [Night Sky Network](#) page through NASA's website!



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.