

# PrimeFocus



## Observing the Upper-Atmosphere with Satellite Stellar Occultation Measurements

Dr. Dana McGuffin, Lawrence Livermore National Laboratory

In this talk we will investigate measurements from an orbiting nanosatellite and upcoming measurements from an instrument that Lawrence Livermore National Laboratory (LLNL) is adding to the International Space Station in 2023. We will discuss how well we can retrieve the atmospheric profile (temperature, density, pressure) and extract atmospheric gravity waves under both instruments.

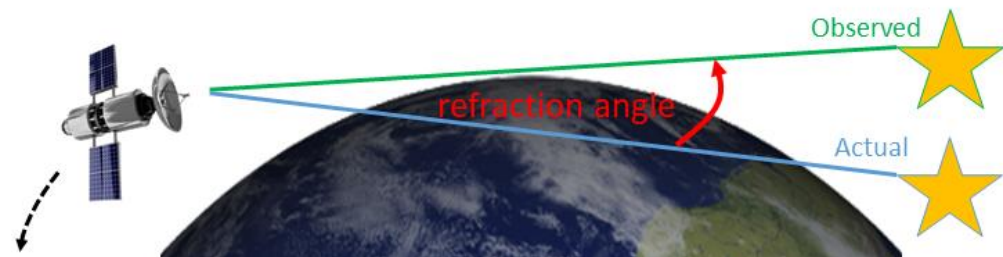
## Measuring Atmospheric Refraction with Stellar Occultation

### WHEN:

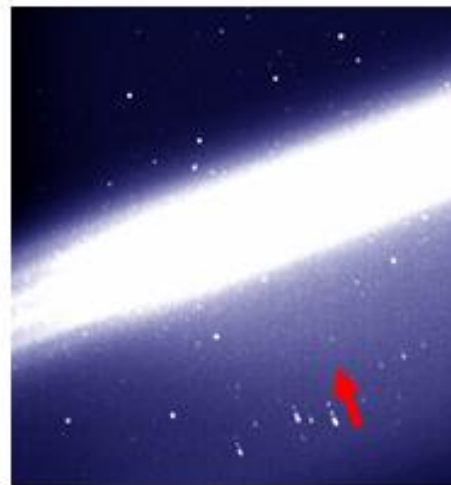
April 15, 2022  
Meeting at 7:30pm  
Lecture at 8:00pm

### WHERE:

Virtual Meeting using Zoom  
See the April 2020 issue of PrimeFocus for info on getting connected using Zoom



### TVS QR Code



LLNL-PRES-832899

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Caption: Schematic of a limb sounding satellite performing stellar occultation shown at the top. A stacked image of several exposures during a stellar occultation event is shown at the bottom with the Earth center towards the bottom right and the bright airglow across the center. Stars in the atmosphere appear to move upwards, as shown in the red arrow, due to atmospheric refraction.

Dana McGuffin is a postdoctoral researcher at LLNL after completing a Ph.D. in May 2020. At LLNL, she analyzes satellite stellar occultation measurements to understand the upper-atmosphere turbulence and gravity waves.

# News and Notes

## 2022 Meeting Dates

Lecture Meeting	Board Meeting	PrimeFocus Deadline
Apr. 15	Apr. 18	
May 20	May 23	May 6
Jun. 17	Jun. 20	Jun. 3
Jul. 15	Jul. 18	Jul. 1
Aug. 19	Aug. 22	Aug. 5
Sep. 16	Sep. 19	Sep. 2
Oct. 21	Oct. 24	Oct. 7
Nov. 18	Nov. 21	Nov. 4
Dec. 16	Dec. 19	Dec. 2

## Money Matters

As of the last Treasurer's Report on 03/21/22, our club's account balance is \$66,714.11. This includes \$43,107.14 in the H2O Rebuild fund.

## TVS Welcomes New Members

TVS welcomes new members Adam Brooks, Paul Picazo, and Peter Stephenson. Please say hello and chat with them during our Zoom meetings.

## 2022 Club Star Party Schedule

Save the dates for the 2022 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 the public. 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 observer's can preserve their night vision.

June 18: H2O Open House with caravan departing promptly at 6:30pm from Mines and Tesla Roads.

August 20: H2O Open House with caravan departing promptly at 6:30pm from Mines and Tesla Roads.

## Barcroft High Altitude Star Party

Reservations for the Eastbay Astronomical Society's Barcroft High-Altitude Star Party are now open to members of both the EAS and Tri-Valley Stargazer's clubs. This year's event will be held from Saturday, August 27 through Friday, September 2nd (with departure by noon of Friday, September 2nd). That's six

nights. Space at Barcroft is limited to a maximum of 12 people per day, so to ensure you get the days you want, make your reservations early.

Before sending payments for reservations (\$65 per night, per person), even if you've been there before, please contact Don Saito FIRST ([barcroft@eastbayastro.org](mailto:barcroft@eastbayastro.org)) to ensure the dates you wish to attend are available. You will also be asked to read the [Barcroft Writeup](#), as it provides the information you'll need to have a safe, comfortable stay, and what is expected of guests to this University of California research facility.

For more details on making a reservation, see: <https://eastbayastro.org/events/>

## H2O Rebuild Update

The H2O Rebuild Committee has developed a Construction Project Statement of Work. It details the requirements for telescope pier construction, observatory foundation and wall construction, and a separate concrete pad for observing. The Statement of Work has been provided to two contractors with the expectation of receiving price quotes for the proposed work in the near future.

# Calendar of Events

## April 16, 1:00pm-2:00pm

What: Investigating Space: Spacecraft of SpaceX  
Who: Erik Li, Former SpaceX Dragon and Falcon Supervisor

Where: Chabot Space and Science Center, 10000 Skyline Blvd. Oakland, CA 94619

Cost: General Admission

As part of NASA's Commercial Crew Program, the fourth SpaceX Crew Dragon spacecraft and Falcon 9 rocket is preparing to launch from Kennedy Space Center later in April! This mission will carry 4 astronauts to the International Space Station.

Chabot welcomes former SpaceX Dragon and Falcon Quality Supervisor Erik Li to give an insider's viewpoint and discuss the spacecraft that will launch the Crew-4 team. Program host and Museum Educator Maxwell Edmonds-Drati will join the conversation with Erik Li to discuss more about the upcoming launch. Learn more in the latest installment of Investigating Space!

Join us every third Saturday of the month for Investigating Space as we explore and discuss the big topics in space exploration with some of the leading scientists and researchers in the Bay Area. In this new series Chabot Space & Science Center highlights the latest discoveries, science research and space missions.

# Calendar of Events (con't)

For COVID-19 Restrictions, see:

<https://chabotspace.org/visit/plan-your-visit/>

For more information, see:

<https://chabotspace.org/events/events-listing/>

**April 16, 22, 23, 29, 30, May 6, 7, 7:30pm-10:30pm**

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. Our observatory deck offers breathtaking views 1,500 feet above the Bay. 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).

For COVID-19 Restrictions, see:

<https://chabotspace.org/visit/plan-your-visit/>

For more information, see:

<https://chabotspace.org/events/events-listing/>

**April 20, 10:00am-11:00am**

What: Got Metal? Life and Metals, the Unexpected

Connection

Who: Prof. Donato Giovannelli and Prof. Giovanni Covone, University of Naples Federico II

Sponsor: SETI Institute

Online: REGISTRATION REQUIRED

<https://www.eventbrite.com/e/got-metal-life-and-metals-the-unexpected-connection-tickets-315596887787>

Single-cell life appears quickly after the formation of our Earth and co-evolve with our planet over the eons. Biologists understand that all life requires trace elements, many of which are metals, to perform crucial chemical reactions. Recent studies show that geological activity, such as plate tectonics, plays a key role in controlling when and which metals are available for life during evolution.

We don't yet know how life appears and could thrive in extreme conditions and the importance of the concentration of metals to increase or stop this coevolution. This question is essential in the framework of the discovery of exoplanets which form in different conditions and probably evolve differently.

For more information, see: <https://www.seti.org/talks>

**April 27, 7:00pm**

What: Cosmobiology: Recent Progress in Cosmology, Exoplanets, and the Astrobiological Prerequisites for Life

Who: Dr. Charles Lineweaver, Australian National University

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## Officers

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## Refreshment Coordinator

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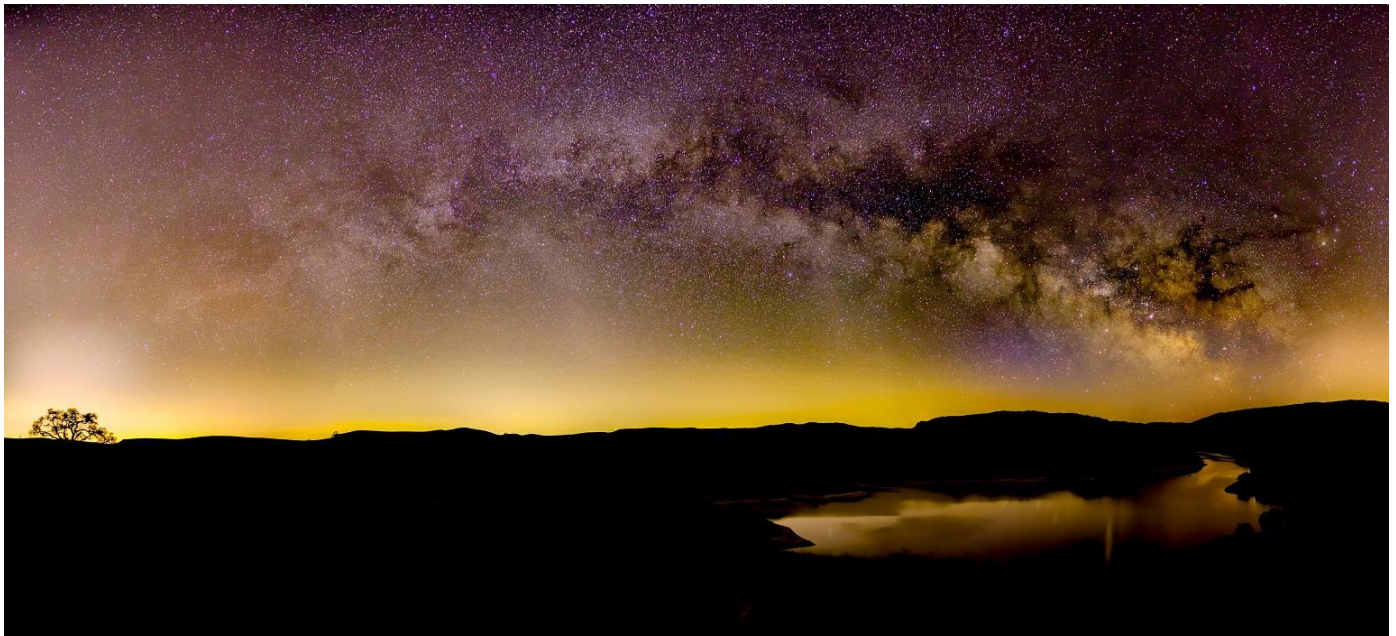
## Web & E-mail

www.trivalleystargazers.org  
info@trivalleystargazers.org

## TVS E-Group

To join the TVS e-group just send an email message to TVS at: info@trivalleystargazers.org asking to join the group. Make sure you specify the e-mail address you want to use to read and post to the group.

# TVS Astrophotos: Milky Way Rising Over Del Valle Site



Caption: Kai Yung imaged the Milky Way from the north end of Lake Del Valle. Despite light pollution, Milky Way dust lanes and many bright nebulae are visible, reaching from the North American Nebula in Cygnus (middle, 1/3 from the left) to the Pipe Nebula and Antares/Rho Ophiuchi in Scorpius (middle, right).

## Calendar of Events (con't)

Sponsor: Foothill College

Online: [www.youtube.com/user/SVAstronomyLectures](http://www.youtube.com/user/SVAstronomyLectures)

No details available.

For more information, see: <https://foothill.edu/astronomy/>

**May 2, 7:30pm**

What: Indigenizing Astronomy: Cultural Perspectives on the Sky and the Future of Research

Who: Laurie Rousseau-Nepton, Resident Astronomer  
Canada-France-Hawai'i-Telescope

Where: Golden Gate Park, 55 Music Concourse Drive,  
San Francisco

Cost: Members and Seniors \$12, Guests \$15

Canadian Indigenous Astronomer Dr. Laurie Rousseau-Nepton is inviting you for an immersive journey into the First Nation of Canada's perspective on our Universe. Myths and Legends often reveal a deep understanding of astronomical phenomena from the physics concepts to the complex interaction between our environment on Earth, the seasons, and the movement of the celestial bodies. Ultimately aiming at reviving ancestral knowledge, she will also discuss different paths to indigenizing astronomy by transforming both our

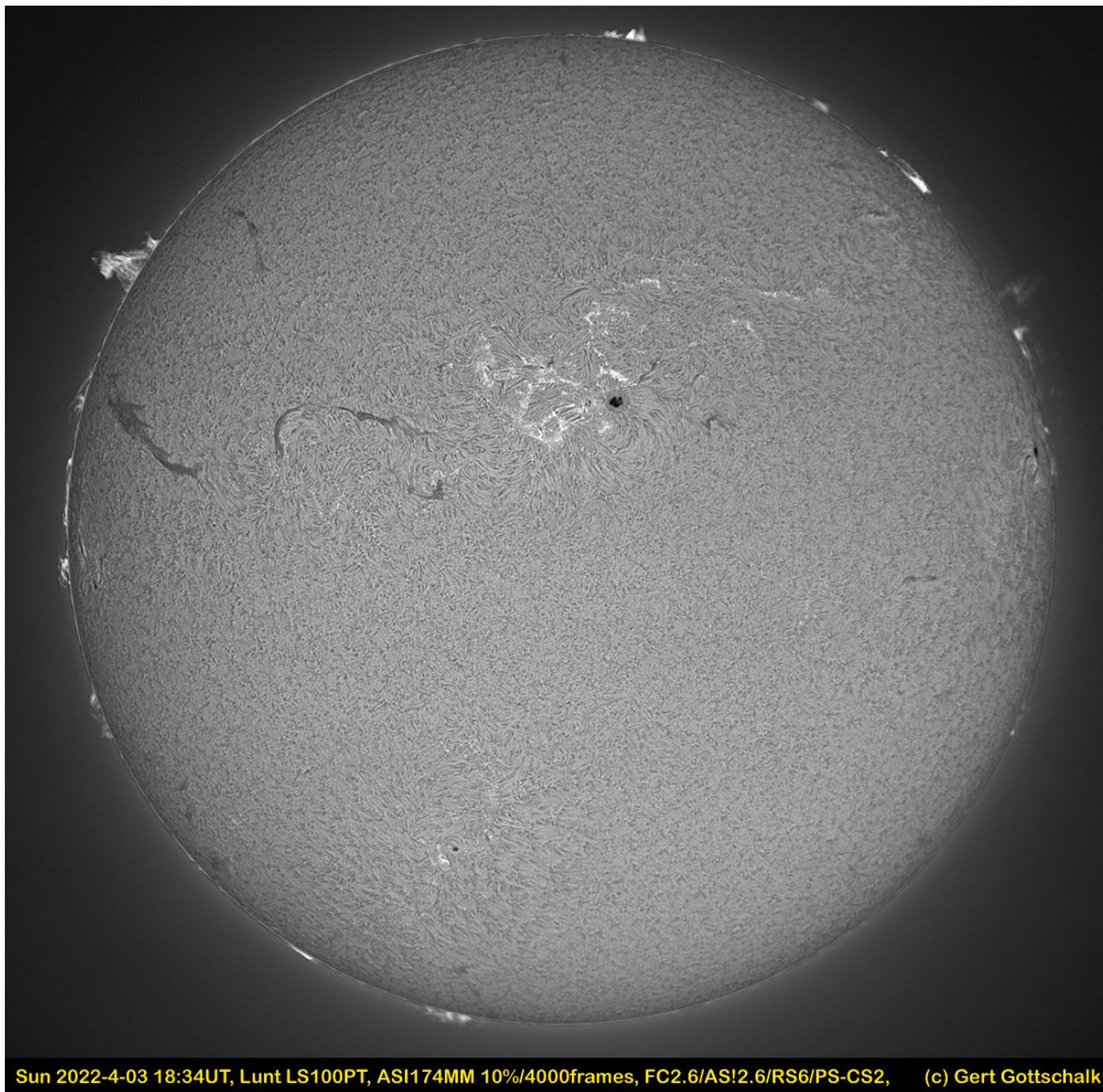
ways of talking about science, teaching, and conducting research.

Accompanying Dr. Rousseau-Nepton's presentation, we will host the West Coast premiere of cultural and Indigenous short films produced by the One Sky Project.

For more information, see:

<https://www.calacademy.org/events/benjamin-dean-astronomy-lectures>

## TVS Astrophotos: Solar Activity on the Rise



Caption: The 11-year solar activity cycle is again on the upswing. The record keeping of solar cycles started in 1755, so the current cycle is number 25. Sunspot statistics indicated the last minimum (and thus start of the new cycle) happened in December 2019. Since then, a slow pickup of activity has been observed. Above, I show an image of the Sun from April 3rd. There is an active sunspot near the center. To its left, dark filaments cross the solar atmosphere. If we see the same filaments over the Sun's limb, we call them prominences; we see an example at the left limb. The prominences are not as bright as the solar atmosphere, so for the image two exposures were combined in image processing software. The images are processed from a Lunt LS100PT solar H-Alpha telescope, recorded with ASI174MM b/w camera. The sharpest 10% of ca. 4000 recorded video frames were picked for processing, stacking, and sharpening. Image: Gert Gottschalk, TVS.

# What's Up By Ken Sperber (adapted from S&T)

All times are Pacific Daylight Time

## April

- 16 Sat Jupiter, Venus, Mars, and Saturn adorn the east-southeast (Dawn)
- 16 Sat Full Moon (11:55am)**
- 19 Tue The Moon, in Scorpius, is 6° to the right of Antares (Morning)
- 22 Fri The Lyrid meteor shower peaks (Morning)
- 23 Sat Last-Quarter Moon (4:56am)**
- 25 Mon The Moon, Saturn, and Mars form a triangle, with Venus and Jupiter lower in the east (Dawn)
- 26 Tue The Moon is nearly midway between Venus and Mars (Dawn)
- 27 Wed The Moon forms a triangle with Jupiter and Venus low in the east (Dawn)
- 29 Fri Mercury is to the lower left of The Pleiades, very low in the west-northwest (Dusk)
- 30 Sat Jupiter and Venus, separated by 0.5°, rise in the east (Dawn)
- 30 Sat New Moon (1:28pm)**

## May

- 1 Sun Venus and Jupiter are separated by only 0.5° as they climb in the east-southeast (Dawn)
- 2 Mon Aldebaran, the crescent Moon, Mercury, and the Pleiades arc above the west-northwestern horizon (Dusk)
- 6 Fri The Eta Aquariid meteor shower peaks (Morning; see p.49 of May S&T)
- 6 Fri The crescent Moon and Pollux are separated by 2.5° as they sink in the west-northwest (Dusk)
- 7 Sat The nearly first-quarter Moon is ~3° north of M44, the Beehive Cluster (Dusk; binoculars suggested)
- 8 Sun First-Quarter Moon (5:21pm)**
- 9 Mon The Moon is in Leo, ~4.5° from Regulus (Dusk)
- 13 Fri The Moon is in Virgo, ~4° to the upper left of Spica (Evening)
- 15 Sun Total Lunar Eclipse: Full Moon rises entering umbra (Totality from 8:29pm-9:54pm; see p.48 of May S&T)**
- 16 Mon The Moon, in Scorpius, is 2° from Antares (Evening)
- 22 Sun The last-quarter Moon is 5° below Saturn (Morning)
- 22 Sun Last-Quarter Moon (11:43am)**
- 24 Tue Jupiter and Mars rise together in the east with the Moon 7° to their right (Morning)
- 25 Wed Jupiter, Mars, and the Moon form a compact group as they rise together (Dawn)
- 27 Fri The thin crescent Moon is 3.5° below left of Venus, low in the east-southeast (Dawn)
- 29 Sun Jupiter and Mars, separated by 0.5°, rise in the east-southeast (Dawn)
- 30 Mon New Moon (4:30am)**



## Springtime Catspotting: Lynx & Leo Minor

By David Prosper

Many constellations are bright, big, and fairly easy to spot. Others can be surprisingly small and faint, but with practice even these challenging star patterns become easier to discern. A couple of fun fainter constellations can be found in between the brighter stars of Ursa Major, Leo, and Gemini: **Lynx** and **Leo Minor**, two wild cats hunting among the menagerie of animal-themed northern star patterns!

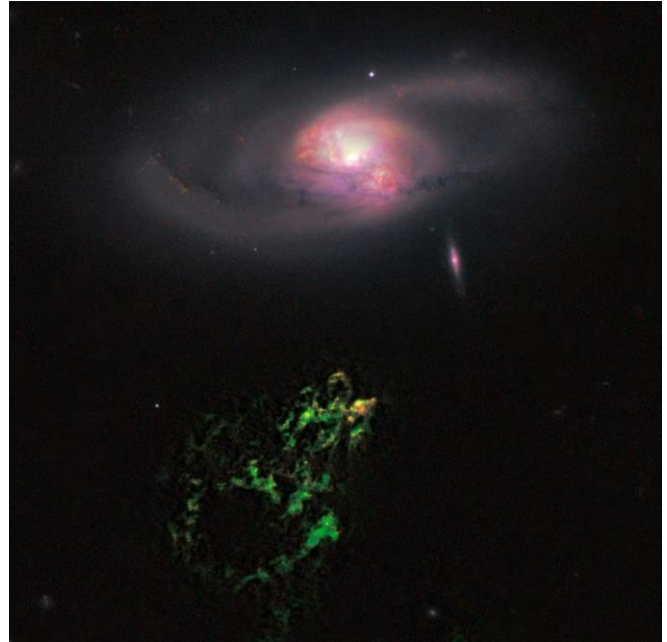


Caption: Map of the sky around Lynx and Leo Minor. If you are having difficulty locating the fainter stars of Leo Minor and Lynx, don't fret; they are indeed a challenge. Hevelius even named the constellation as reference to the quality of eyesight one needs in order to discern these faint stars, since supposedly one would need eyes as sharp as a Lynx to see it! Darker skies will indeed make your search easier. While you will be able to see NGC 2419 with a backyard telescope, Hanny's Voorwerp is far too faint, but its location is still marked. Image created with assistance from Stellarium.

**Lynx**, named for the species of wild cat, is seen as a faint zigzag pattern found between Ursa Major, Gemini, and Auriga. Grab a telescope and try to spot the remote starry orb of globular cluster NGC 2419. As it is so distant compared to other globular clusters - 300,000 light years from both our solar system and the center of the Milky Way - it was thought that this cluster may be the remnants of a dwarf galaxy consumed by our own. Additional studies have muddied the waters concerning its possible origins, revealing two distinct populations of stars residing in NGC 2419, which is unusual for normally-homogenous globular clusters and marks it as a fascinating object for further research.

**Leo Minor** is a faint and diminutive set of stars. Its "triangle" is most noticeable, tucked in between Leo and Ursa Major. Leo Minor is the cub of Leo the Lion, similar to Ursa Minor being the cub to the Great Bear of Ursa Major. While home to some

interesting galaxies that can be observed from large amateur scopes under dark skies, perhaps the most intriguing object found within Leo Minor's borders is Hanny's Voorwerp. This unusual deep-space object is thought to be a possible "light echo" of a quasar in neighboring galaxy IC 2497 that has recently "switched off." It was found by Hanny van Arkel, a Dutch schoolteacher, via her participation in the Galaxy Zoo citizen science project. Since then, a few more intriguing objects similar to Hanny's discovery have been found, called "Voorwerpjes."



Caption: Hanny's Voorwerp and the neighboring galaxy IC 2497, as imaged by Hubble. Credits: NASA, ESA, W. Keel (University of Alabama), and the Galaxy Zoo Team. Source: <https://hubblesite.org/contents/news-releases/2011/news-2011-01.html>

Lynx and Leo Minor are relatively "new" constellations, as they were both created by the legendarily sharp-eyed European astronomer Johannes Hevelius in the late 1600s. A few other constellations originated by Hevelius are still in official use: Canes Venatici, Lacerta, Scutum, Sextans, and Vulpecula. What if your eyes aren't quite as sharp as Johannes Hevelius – or if your weather and light pollution make searching for fainter stars more difficult than enjoyable? See if you can spot the next Voorwerp by participating in one of the many citizen science programs offered by NASA at: [science.nasa.gov/citizenscience](https://science.nasa.gov/citizenscience)! And of course, you can find the latest updates and observations of even more dim and distant objects at [nasa.gov](https://nasa.gov)

This article is distributed by the NASA Night Sky Network, a coalition of hundreds of astronomy clubs across the US dedicated to astronomy outreach. Visit [nightsky.jpl.nasa.gov](https://nightsky.jpl.nasa.gov) to find local clubs, events, stargazing info and more.



Tri-Valley Stargazers  
P.O. Box 2476  
Livermore, CA 94551  
[www.trivalleystargazers.org](http://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.