

# PrimeFocus



## WHEN:

May 19, 2023  
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

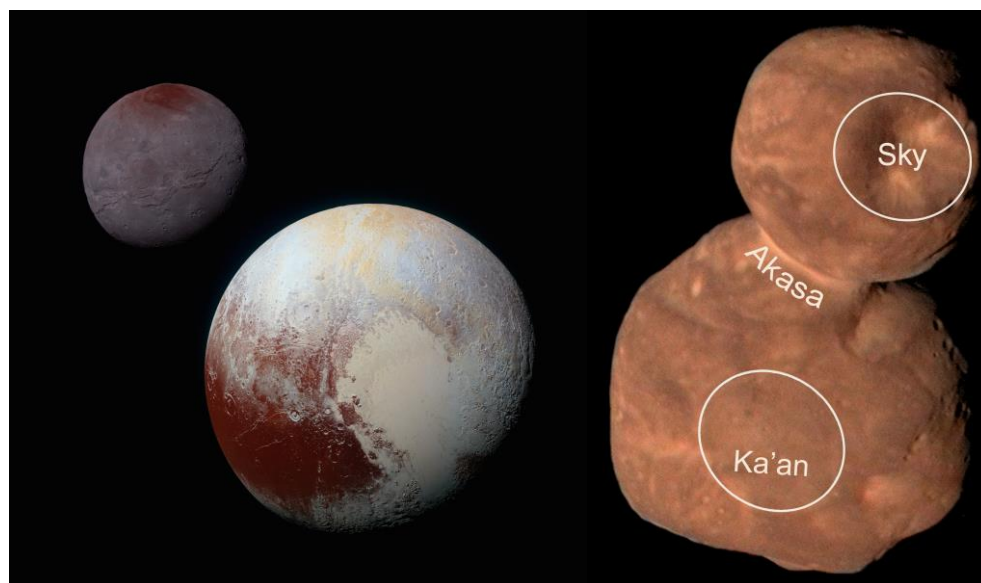


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## NASA's New Horizons Mission to Pluto and the Kuiper Belt Dr. Will Grundy, Lowell Observatory

With its 2015 flyby and first up-close look at a new class of small icy planet, the New Horizons mission ushered in a new era of planetary geology for the Pluto system. A second flyby of the small Kuiper belt object Arrokoth at the start of 2019 did the same for the much smaller planetesimals at the edge of the solar system, leftovers from the era of planet formation. This talk will introduce the spacecraft, instruments, and mission profile, and describe some of the scientific highlights.



Caption: Left: This composite of enhanced color images of Pluto (lower right) and Charon (upper left), was taken by NASA's New Horizons spacecraft as it passed through the Pluto system on July 14, 2015. This image highlights the striking differences between Pluto and Charon. The color and brightness of both Pluto and Charon have been processed identically to allow direct comparison of their surface properties, and to highlight the similarity between Charon's polar red terrain and Pluto's equatorial red terrain. Pluto and Charon are shown with approximately correct relative sizes, but their true separation is not to scale. The image combines blue, red, and infrared images taken by the spacecraft's Ralph/Multispectral Visual Imaging Camera (MVIC). Image Credit: NASA/JHUAPL/SwRI. Right: Arrokoth (not to scale with Pluto and Charon) was discovered June 26, 2014, by NASA's New Horizons spacecraft team using the Hubble Space Telescope. Arrokoth is the most distant object explored by a spacecraft. Arrokoth is even redder than Pluto. It is, in fact, the reddest outer solar system object visited by a spacecraft thus far. Image credit: NASA/Johns Hopkins Applied Physics Laboratory/Southwest Research Institute. For more information on Pluto, see: <http://pluto.jhuapl.edu/Pluto/The-Pluto-System.php#Pluto> For more information on Arrokoth, see: <https://skyandtelescope.org/astronomy-news/new-horizons-reveals-full-picture-of-arrokoth-and-how-planets-form/>

Dr. Grundy is a tenured planetary scientist at Lowell Observatory, in Flagstaff Arizona and a co-investigator on NASA's New Horizons mission. He studies icy, outer Solar System objects using a variety of experimental techniques, including space- and ground-based imaging and spectroscopy, as well as laboratory studies of low temperature materials. His undergraduate degree was in physics from Yale University (1988) and his Ph.D. was in planetary sciences from the University of Arizona (1995).

# News and Notes

## 2023 Meeting Dates

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

## Money Matters

As of the last Treasurer's Report on 04/24/23, our club's account balance is \$73,268.34. This includes \$43,139.47 in the H2O Rebuild fund.

## TVS Welcomes New Members

TVS welcomes new members Karthikeyan Jothi, Mani Naidu, Satish Narasimhan, Niket Shah, Pranab Sharma, and Dave Wiltzius. Please say hello and chat with them during our meetings.

## 2023 Club Star Party Schedule

Save the dates for the 2023 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.

June 10: Tesla Vintners Star Party, 5143 Telsa Road, Livermore. Set up at 8:00pm, Observing 8:30-11:30pm

June 24: Del Valle Arroyo Staging Area, just past 5055 Arroyo Road, Livermore. Set up at 7:30pm, Public observing 8:30-10:00pm, TVS members can continue to observe after the public leaves.

## Barcroft High Altitude Star Party

Reservations for the Eastbay Astronomical Society's Barcroft High-Altitude Star Party are now open to members of the EAS, the Tri-Valley Stargazers, and the Mount Diablo Astronomical Society clubs. This year's event will be held from Sunday, August 13 through noon on Saturday, August 19 (with departure by noon on Saturday). That's six nights!

Before sending payments for reservations (\$90 per night, per person), even if you've been there before, please FIRST contact Don Saito (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.

Please visit: [East Bay Astronomical Society - Barcroft High Altitude Star Party](#)

# Calendar of Events

## May 19, 20, 26, 27, June 2, 3, 9, 10

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. 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/>

## May 23, 6:00pm

What: Destination Moon

Who: Brian Day (NASA Solar System Exploration Research Virtual Institute)

Sponsor: NASA Night Sky Network

Online: [https://youtube.com/live/\\_HIVcrHRQcY](https://youtube.com/live/_HIVcrHRQcY)

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## News and Notes (con't)

The Artemis missions will include a mix of crewed and robotic landings. Thirteen regions near the South Pole of the Moon have been identified as candidates for human exploration. Some of these same regions have also been targeted for precursor robotic landings through the Commercial Lunar Payload Services (CLPS) Program. In addition, locations away from the South Pole have been designated as targeted sites for robotic exploration due to some fascinating aspects of these sites. Other locations which have not yet been assigned landers are high on the lunar science community's list of important lunar locations to be explored. In this presentation, we will examine key potential target sites on the Moon, discuss what makes them so compelling, and demonstrate how members of the public can conduct their own explorations of these amazing lunar locations using NASA's Moon Trek data visualization and analysis portal.

For more information, see: [https://nightsky.jpl.nasa.gov/news-display.cfm?News\\_ID=707](https://nightsky.jpl.nasa.gov/news-display.cfm?News_ID=707)

### May 23, 7:15pm-9:00pm

What: Cepheids, Supernovae, and the CMB  
Who: Prof. Lloyd Knox, (UC Davis)  
Where: Lindsay Wildlife Experience Community Room,  
1931 First Avenue, Walnut Creek, CA 94597  
Cost: Lecture: Free, Parking \$3

Professor Lloyd Knox, UC Davis. Prof. Knox will discuss a discrepancy between two very different methods of estimating the current rate of expansion of space and how they impact our standard cosmological model. He also will discuss a potential historical analog: the 19th century

astronomical discrepancy between two different methods of determining the perihelion precession of Mercury -- a discrepancy that persisted for decades until it was finally resolved by replacement of Newtonian gravitational theory with Einstein's general theory of relativity.

The meeting starts at 7:15 p.m. with a short "What's Up?" presented by MDAS member Mike Harms, who will discuss optical sky phenomena such as rainbows, sun dogs, halos, iridescence, and crepuscular rays, including what conditions are necessary to see them.

For more information, see: [www.meetup.com/A-A-N-C/events/293414593](http://www.meetup.com/A-A-N-C/events/293414593)

### May 28, 6:00pm – May 29 9:00am

What: Slumber With The Stars Family Sleepover  
Who: Chabot Staff  
Where: Chabot Space and Science Center, 10000 Skyline Blvd. Oakland, CA 94619  
Cost: \$100, \$95 Members, Ages 4+

Join us for a night of otherworldly exploration as we investigate the atmospheric features of our home planet in comparison to that of other planets in our solar system and beyond. Experience the live science theater performance of Planet Hunter, where you the audience get to be part of the show as we look for the best places to find undiscovered exoplanets. You'll also take part in hands-on activities and demonstrations such as ice orbs, atmosphere analyzers, and DIY exoplanets.

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#### **Officers**

##### **President**

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##### **Refreshment Coordinator**

**OPEN**

##### **Webmaster**

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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.

## Calendar of Events (con't)

Your getaway includes a casual dinner, continental breakfast, and indoor and outdoor sleeping options.

Please note that the planetarium will be closed for upgrades during this event.

For more information, see:

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

### June 2, 6:00pm-10:00pm

What: First Friday: Climate Series: Atmospheric Extremes

Who: Chabot Staff

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

Cost: \$15 Adults, \$10 kids/seniors, \$5 members

Evidence for the extreme weather conditions we are experiencing in North America is becoming more frequent and highlighting the real effects of climate change. Throughout the Bay Area and California, we have experienced extreme heat, atmospheric rivers, sea level rise, low water reservoirs, massive lightning strikes, high winds, severe air conditions due to wildfires, depleted snowpacks, and other conditions that have impacted people, animals, land, waterways, and agriculture. Join us for a night of ideas and solutions as we explore our changing climate.

For more information, see:

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

### June 12, 7:30pm

What: Charting the High Frontier of Space

Who: Dr. Ed Lu (Former Astronaut, Executive Director of the Asteroid Institute)

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

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

Dr. Ed Lu will present the case for a four-dimensional solar system map in a talk titled "Charting the High Frontier of Space." The map he and his Asteroid Institute team are building is the key to protecting Earth from asteroid impacts and will also help spur future scientific exploration and commercial activities in space.

For more information, see: [Benjamin Dean Astronomy Lecture](#)

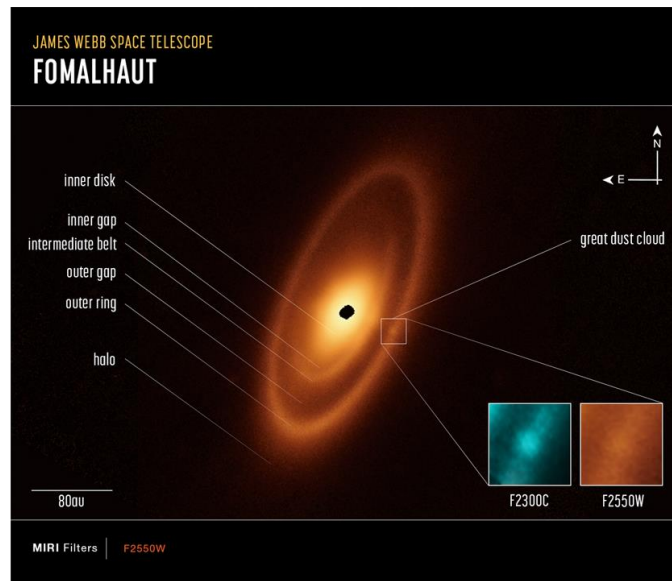
## Astronomy Update By Ken Sperber

Fomalhaut, the 18<sup>th</sup> brightest star in the night sky at 1.2mag, has recently been in the news. Fomalhaut is located about 25 light years away in the constellation Pisces Austrinus. Given its southern declination (-29° 29'), it is best visible in the Bay area at about 11pm during September and October when it reaches 20-24° elevation.

Great interest in Fomalhaut began in 1983 when the Infrared Astronomical Satellite (IRAS) detected an excess of infrared radiation surrounding the star. This indicated the presence of a debris disk surrounding the star. The 25AU wide debris disk was seen to begin about 133AU from the star (one AU, Astronomical Unit, equals the mean distance between the Sun and Earth). The well-defined edge of the disk suggested the presence of planet.

Observations with the Hubble Space Telescope Advanced Camera for Surveys appeared to find a planet with a mass of about 3 Jupiter's. The object was tracked from 2004-2014, but then subsequently disappeared. The current belief is that it was a compact dust cloud that subsequently dispersed.

The extensive range of infrared wavelengths covered by the JWST has revolutionized our knowledge of Fomalhaut. Imaged at 23 and 25.5 microns, Fomalhaut is surrounded by an inner disk, and intermediate belt, and an outer ring and halo with a diameter of ~250 AU. The inner disk is analogous to our Solar Systems Asteroid belt, and the intermediate belt and outer ring are analogous to our Kuiper Belt. Within the outer ring of Fomalhaut, the observations at 23 microns reveals the presence of a dust cloud. Gaps in the disk strongly suggest the presence of unseen planets, which clear out their immediate environment and shepherd the disk/belt.

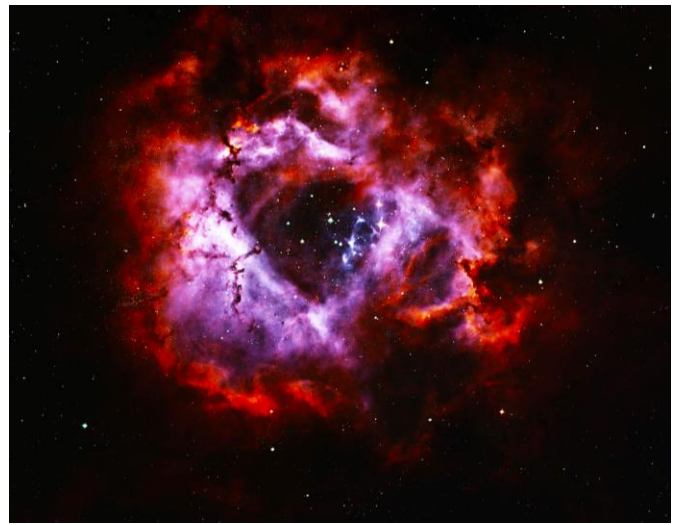


Caption: This image of Fomalhaut has all of its structures labeled. The outer ring is about 240 astronomical units in diameter. At right, a great dust cloud is highlighted and pullouts show it in two infrared wavelengths: 23 and 25.5 microns. Credit: NASA / ESA / CSA / A. Pagan (STScI) / A. Gáspár (University of Arizona)

For more information on the Fomalhaut Debris Disk, see: [www.nasa.gov/feature/goddard/2023/webb-looks-for-fomalhaut-s-asteroid-belt-and-finds-much-more](http://www.nasa.gov/feature/goddard/2023/webb-looks-for-fomalhaut-s-asteroid-belt-and-finds-much-more) and

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# TVS Astrophotography: The Many Faces of the Rosette Nebula



Caption: The Rosette Nebula is an emission nebula in the constellation Monoceros with an apparent diameter of 24 arc minutes. The Open Cluster at its center, known as NGC2244, contains hot O-Type stars that give rise to the radiation that causes the emission of the Rosette Nebula.

Upper left: Kevin McLoughlin imaged the Rosette Nebula from his home in light polluted Oakland. This was made possible by his use of an Optolong L-Ultimate Filter with his ZWO ASI2600MC Pro camera on a Sigma 150-600 (f/5-6.3) lens. The total exposure time was 3 hours 18 minutes.

Remaining 3 images: Aris Pope imaged the Rosette Nebula using a GSO 6" f/4 Newtonian with a ZWO ASI294MC Pro camera and an Optolong L-eXtreme filter. The total exposure time was 3 hours 10 minutes. Upper right and Lower left: These images were processed in Pixinsight using pixelmath stretching by Bill Blanshan using differing curves transformations for saturation and hue adjustments. Lower right: The narrowband normalization was done with pixelmath provided by Bill Blanshan on his YouTube channel. He came up with the HOO pixelmath from a method used by Luke Newbould, aka Lukomatico, that helps the OIII "pop". The pixelmath processes are downloadable via the links in the videos: <https://youtu.be/PpIOSSj4L5g> and <https://youtu.be/6in5Kvo95s> It's just drag and drop for anyone using Pixinsight!

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

All times are Pacific Daylight Time

### May

- 17 Wed In the east, the Moon Occults Jupiter from ~4:20-5:20am (see p.48 of the May 2023 S&T)
- 19 Fri **New Moon (8:53am)**
- 21 Sun In the west, Venus, Castor, and Pollux form a triangle, with the Moon to their lower right (Dusk)
- 22 Mon In the WNW, the Moon and Venus are separated by ~5° (Evening)
- 23 Tue The Moon is ~2° to the lower left of Pollux, with Venus ~5.5° below the pair (Evening)
- 24 Wed In the west, the Moon is equidistant (~4°) from Mars and M44, the Beehive Cluster. Use binoculars (Dusk)
- 26 Fri In the west, the Moon is ~3.5° from Regulus (Evening)
- 27 Sat **First-Quarter Moon (8:22am)**
- 28-29 Sun- On both nights, in the WNW, Venus is ~4° from Pollux (Dusk)
- 31 Wed The Moon and Spica, separated by ~4°, descend toward the WSW horizon (Morning)
- 31 Wed In the west, Mars hovers on the outskirts of M44, the Beehive Cluster (Evening)

### June

- 1 Thu Venus, in Gemini, forms a line with Castor and Pollux (Dusk)
- 2 Fri Mars hovers above the Beehive Cluster (M44); use binoculars (Evening)
- 3 Sat **Full Moon trails Antares by ~3° (8:42am)**
- 10 Sat In the SE, the Last Quarter Moon follows Saturn by ~6.5° (Morning)
- 10 Sat **Last-Quarter Moon (12:31pm)**
- 13 Tue Venus visits the Beehive Cluster (M44) with Mars ~6° to their upper left (Evening)
- 14 Wed The crescent Moon and Jupiter rise in tandem, separated by ~2° (Morning)
- 16 Fri The thin crescent Moon rises in the ENE, trailing the Pleiades (M45) and preceding Mercury (Dawn)
- 17 Sat **New Moon (9:37pm)**
- 19 Mon The Moon forms a triangle with Castor and Pollux low in the WNW (Dusk)
- 21 Wed **Northern Hemisphere Summer Solstice (10:58am)**
- 21 Wed The crescent Moon, Venus, and Mars form a tight triangle (Dusk)
- 22 Thu The Moon is ~5.5° to the right of Regulus, with Mars and Venus to their lower right (Evening)
- 26 Mon **First-Quarter Moon (12:50am)**
- 27 Tue In the SSW, the Moon is ~3° to the upper left of Spica (Dusk)
- 28 Wed In the west, Mars and Venus are separated by ~3.5° (Evening)
- 30 Fri In the south, the Moon is ~2.5° right of Antares (Evening)

## Astronomy Update By Ken Sperber

<https://skyandtelescope.org/astronomy-news/the-james-webb-space-telescope-reveals-fomalhauts-disk-in-unprecedented-detail/>



these dark clouds in their traditional stories along with the constellations and Milky Way.

## Observe the Milky Way and Great Rift

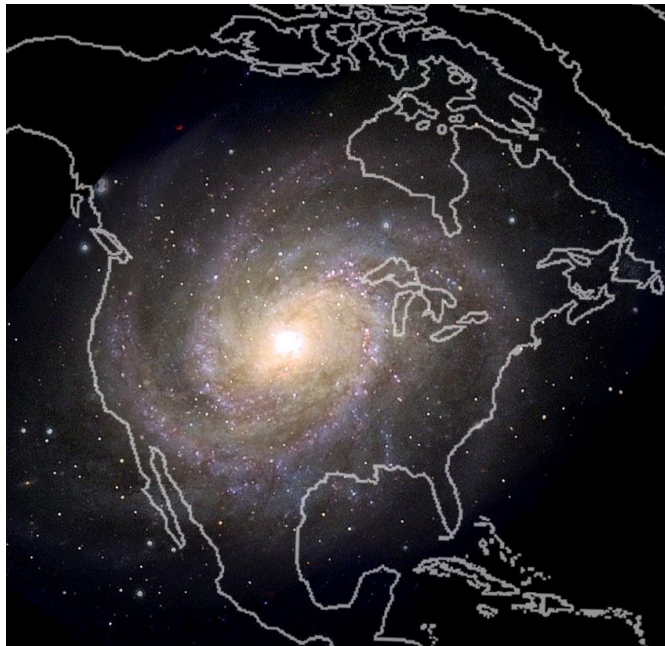
Summer skies bring glorious views of our own Milky Way galaxy to observers blessed with dark skies. For many city dwellers, their first sight of the Milky Way comes during trips to rural areas - so if you are traveling away from city lights, do yourself a favor and look up!

To observe the Milky Way, you need clear, dark skies, and enough time to adapt your eyes to the dark. Photos of the Milky Way are breathtaking, but they usually show far more detail and color than the human eye can see – that’s the beauty and quietly deceptive nature of long exposure photography. For Northern Hemisphere observers, the most prominent portion of the Milky Way rises in the southeast as marked by the constellations Scorpius and Sagittarius. Take note that, even in dark skies, the Milky Way isn’t easily visible until it rises a bit above the horizon and the thick, turbulent air which obscures the view. The Milky Way is huge, but is also rather faint, and our eyes need time to truly adjust to the dark and see it in any detail. Try not to check your phone while you wait, as its light will reset your night vision. It’s best to attempt to view the Milky Way when the Moon is at a new or crescent phase; you don’t want the Moon’s brilliant light washing out any potential views, especially since a full Moon is up all night.



Caption: The Great Rift is shown in more detail in this photo of the Milky Way. You can see why it is also called the “Dark Rift.” Credit: [NASA/A.Fujii](#)

Keeping your eyes dark adapted is especially important if you want to not only see the haze of the Milky Way, but also the dark lane cutting into that haze, stretching from the Summer Triangle to Sagittarius. This dark detail is known as the Great Rift, and is seen more readily in very dark skies, especially dark, dry skies found in high desert regions. What exactly is the Great Rift? You are looking at massive clouds of galactic dust lying between Earth and the interior of the Milky Way. Other “dark nebulae” of cosmic clouds pepper the Milky Way, including the famed Coalsack, found in the Southern Hemisphere constellation of Crux. Many cultures celebrate



Caption: If the Milky Way was shrunk down to the size of North America, our solar system would be about the size of a quarter. At that scale, the North Star, Polaris - which is about 433 light years distant from us - would be 11 miles away! Find more ways to visualize these immense sizes with the [Our Place in Our Galaxy](#) activity.

Where exactly is our solar system within the Milky Way? Is there a way to get a sense of scale? The “[Our Place in Our Galaxy](#)” activity can help you do just that, with only birdseed, a coin, and your imagination. You can also discover the amazing science NASA is doing to understand our galaxy – and our place in it - at [nasa.gov](#).

**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](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.