

PrimeFocus



WHEN:

September 16, 2022
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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The Evolution from Missing to Dark Dr. David Dearborn, Lawrence Livermore National Laboratory

A century ago, the hot topic of the 1920's was the structure of the universe. Was the universe a single Galaxy or was the Milky Way just one of many galaxies? This was resolved by the late 20's and the general expansion was discovered. With the recognition that the galaxies were separate island universes, studies of their groupings (late 30's) quickly led to a dilemma. Where was all the mass? In the late 70's the dilemma was extended to individual galaxies that could be well observed. Was the mass hidden as very hot or very cold gas? Was it in clumps (machos)? Was gravity itself different at large scales? Step by step the mundane solutions were eliminated, and the composition of the big bang itself argued that this mass was not ordinary (Baryonic) matter. Worse, the missing (dark) matter was insufficient to create the flat universe that was observed (CMB). Cosmologists started reviving Einstein's greatest blunder, Λ , the cosmological constant. Then came dark energy!



Caption: This NASA Hubble Space Telescope image shows the distribution of dark matter in the center of the giant galaxy cluster Abell 1689, containing about 1,000 galaxies and trillions of stars. Researchers used the observed positions of 135 lensed images of 42 background galaxies to calculate the location and amount of dark matter in the cluster. They superimposed a map of these inferred dark matter concentrations, tinted blue, on an image of the cluster taken by Hubble's Advanced Camera for Surveys.

Image Credit: NASA/JPL-Caltech/ESA/Institute of Astrophysics of Andalusia, University of Basque Country/JHU.

<https://photojournal.jpl.nasa.gov/catalog/PIA13616>

Today we are sorting through an understanding of known particles (neutrino masses), theorized particles with motivation from physics (axions, ...), and without (Wimps of various properties). With LIGO, matter bound up in primordial black holes formed before the era of nucleosynthesis is being studied. We do not yet have final answers on the nature of the dark/missing matter, or dark energy, but we come closer each year.

Dr. David S. P. Dearborn is a graduate of UCLA (1970) and the University of Texas at Austin (1975). He has held positions at the Copernicus Institute in Warsaw, the Institute of Astronomy in Cambridge, The California Institute of Technology, and Steward Observatory in Tucson. For the last 35 years, he has been a research physicist/astrophysicist at the Lawrence Livermore National Laboratory (LLNL). While most of his LLNL research has supported programmatic efforts, he has maintained an active presence in astrophysics, and recently become involved in planetary physics (asteroid deflection). He has also published significantly in Andean studies (particularly Inca Astronomy).

News and Notes

2022 Meeting Dates

Lecture Meeting	Board Meeting	PrimeFocus Deadline
Sep. 16	Sep.19	
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 08/22/22, our club's account balance is \$67,067.353. This includes \$43,123.90 in the H2O Rebuild fund.

The board has authorized the purchase of a Unistellar eVscope at a cost of \$3000. The eVscope will be used at star party events, especially public outreach events. The App based visualization of eVscope targets will enhance the number of people who can experience the night sky. People will be able to download the eVscope images to their smart devices and thus have a record of their experience to take home with them.

TVS Elections in November

TVS will soon be electing new members for the board. Please nominate candidates to replace members who will be retiring this year. Contact any club officer with your suggestions, including self-nomination. This is your opportunity to impact the future direction of the club!

TVS Welcomes New Members

TVS welcomes new members Dave Hildebrandt, Puneet Katyal, Yuh-Min Lin, Sophear Nam, Chandresh Patel, and Scott Schneider. Please say hello and chat with them during our 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.

September 17: TVS Club Star Party at Tesla Vintners, 7:00-11:30pm

September 28: John Greene Elementary School, 3300 Antone Way, Dublin. Star party for 5th graders. Setup at 6:15pm, stargazing at 7:00pm

November 3: Livermore Library, setup at 6:00pm, intro-talk at 6:30pm, and stargazing at 7:00pm

TVS Telescopes for Sale

If you have been wanting to purchase a telescope, TVS has numerous options available. These include a 12-inch Dobsonian, Celestron and Meade Schmidt-Cassegrain's ranging in size from 4-8 inches, and Meade and Celestron Maksutov telescopes. Also, available is a tabletop classic 4-inch Astroscan. Full descriptions of the available equipment can be found at: [TVS Telescope Sales](#).

H2O Rebuild Update

Construction on the new observatory is set to begin this month. The contractor and crew will stay over at H2O in a small travel trailer. The schedule is:

Day one: foundation prep, dig, make forms, install rebar

Day two: pour concrete, install pier L-bolts

Wait at least a week to let the concrete partially cure (4-weeks to cure completely)

Day three (possibly longer): build walls, install the door.

Wait at least a week for concrete partially cure

We install pier and dome

During construction, please use extra caution when visiting H2O and keep clear of the construction zone. Safety First!

Calendar of Events

September 17, 12:00pm-3:00pm

What: Investigating Space: Asteroid Impact

Who: Chabot Museum Educator Maxwell Edmonds-Drati

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

Cost: Free with General Admission

Asteroid Impacts NASA's Double Asteroid Redirection Test (DART), the world's first full-scale mission to test technology for defending Earth against potential asteroid or comet hazards is on it's way and will be impacting an asteroid soon. Learn more about this once in a lifetime event at this special program.

For COVID-19 Restrictions, see:

<https://chabot.space.org/visit/plan-your-visit/>

For more information, see:

<https://chabot.space.org/events/events-listing/>

Calendar of Events (con't)

September 23, 6:00pm-9:00pm

What: Sunset Science: Mysteries of Deep Space
Who: Chabot Staff
Where: Chabot Space and Science Center, 10000 Skyline Blvd. Oakland, CA 94619
Cost: \$15 Adult, \$5 Youth, Members Free

Enjoy an autumn night with a festive gathering for the whole family that will explore the deepest regions of our universe in our family friendly program followed by telescope viewing on our observation deck. Engage in hands on activities that explore nebulae, galaxies, star formations and black holes and learn how scientist peer into deep space and make meaning of what they find. Beer, Wine, and concessions will be available.

For COVID-19 Restrictions, see:
<https://chabot.space.org/visit/plan-your-visit/>

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

October 1, 7:00pm-10:00pm

What: International Observe the Moon Night
Who: Foothill College Staff
Where: Foothill College Observatory (near the Krause Center, Parking Lot 4), 12345 El Monte Rd., Los Altos Hills, CA
Cost: Free, but \$3 parking (bring exact change)
The Foothill College Astronomy department and the Peninsula Astronomical Society are hosting lunar viewing as part of NASA's Observe the Moon Night. On October 1, from 7 p.m.

to 10 p.m., we will be observing the moon (and other objects!) from both the Foothill College Observatory and smaller telescopes.

For more information, including COVID-19 restrictions, see:
<https://foothill.edu/astronomy/>

October 1, 7:30pm

What: An Astronomical Perspective on Globular Clusters, Planet Earth, and the Climate Crisis
Who: Prof. Adrienne Cool (San Francisco State University)
Sponsor: Mt. Tam Astronomy Program
Online: [Zoom: Mt Tam](#)

Globular clusters have been providing insight into the structure of the Milky Way and the evolution of stars for more than 100 years. I will describe the role that binary stars play in their fascinating internal dynamics and provide examples of how a cluster's binaries can be revealed using space-based observatories. The unusual perspective that astronomical studies such as these provide on our home planet led to the founding in 2019 of an organization aimed at harnessing this perspective to help combat the climate crisis. The speaker will briefly describe the goals and activities of Astronomers for Planet Earth, which now comprises 1400 astronomy educators, amateurs, students, and researchers worldwide.

For more information, see: mttam Astronomy.org/calendar

October 3, 7:30pm

What: Science, Exploration, and the Human Experience

continued on p.4

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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)

Who: Dr. Darlene S. Lim (NASA/Ames Research Center)
Where: Golden Gate Park, 55 Music Concourse Drive,
San Francisco
Cost: Members and Seniors \$12, Guests \$15

NASA's VIPER lunar mission (Volatiles Investigating Polar Exploration Rover) is a mobile robot that will go to the South Pole of the Moon to get a close-up view of the location and

concentration of water ice that could eventually be harvested to sustain human exploration on the Moon, Mars — and beyond. Managed out of NASA's Ames Research Center in Silicon Valley, VIPER represents the first resource mapping mission on another celestial body and presents a unique operational paradigm within the history of robotic spaceflight.

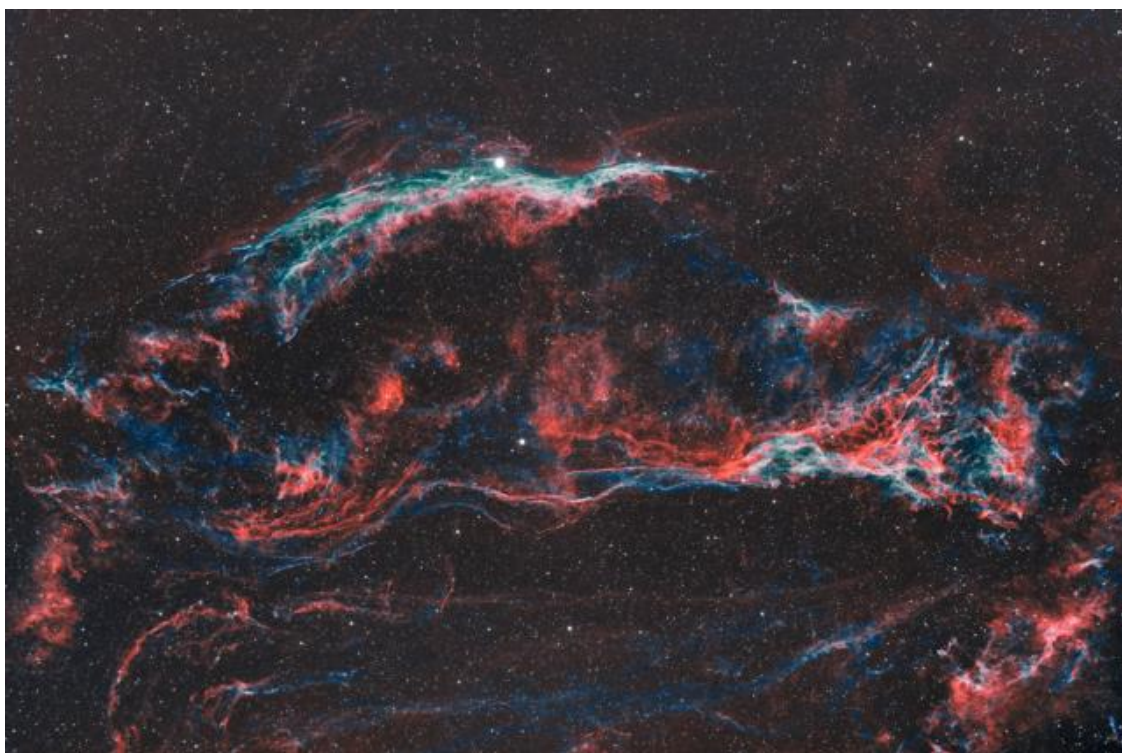
For more information, see: [Benjamin Dean Astronomy Lecture](#)

TVS Open House



Caption: Upper row: Ethan Teng (l) and Scott Schneider (r) captured Open House attendees setting up for a night of observing and imaging. Lower-left: At the Open House, Dave Hildebrandt imaged M17 using a 10-inch Ritchey-Chretien on a Mach 1 Astrophysics mount using 20 x 120 second exposures. Lower-right: At the Open House, Kevin McLoughlin imaged the Herb Quick Dome and the Milky Way using a Nikon D610, ISO-1600, 20 seconds, with a Tokina zoom lens set to 16mm, f/3.2.

TVS Astrophotos By Ashish Josi



Caption: Ashish Josi imaged the Eastern and Western components of the Veil Nebula from Lake San Antonio. He used an Explore Scientific 115mmCF refractor with a focal reducer for an effective focal length of 500mm, f/5.5 on a ZWO AM5 mount. Imaging was with a ZWO ASI2600MM camera using H-alpha, OIII, and SII narrowband filters with 30 x 300sec sub-exposures, each, with dithering every 3 images. Guiding was with a Astromania 60mm refractor using a ZWO ASI290MM.

What's Up

By Ken Sperber (adapted from S&T)

All times are Pacific Daylight Time

September

- 14 Wed Algol at minimum brightness for two hours centered on 9:42pm
- 15 Thu The Moon rises in the ENE, preceded by the Pleiades and trailed by Mars (Evening)
- 16 Fri The Moon, Mars, Aldebaran, and Elnath form a line above the ENE horizon (Evening)
- 17 Sat Last-Quarter Moon (2:52pm)**
- 20 Tue The Moon in Gemini is 3° below Pollux (Dawn)
- 21 Wed The Moon in Cancer is 3° to the upper left of M44, the Beehive Cluster (Dawn)
- 23 Fri The Moon and Regulus, separated by 4.5°, rise in the ENE (Dawn)
- 25 Sun New Moon (2:55pm)**
- 26 Mon Jupiter, at opposition, is the closest to Earth since 1963 (Visible All Night, see p. 48, September S&T)
- 30 Fri The Moon is ~1.5° above Antares in the SW (Dusk)

October

- 2 Sun First-Quarter Moon (5:14pm)**
- 4 Tue Algol at minimum brightness for two hours centered on 11:23pm
- 5 Wed The Moon is ~6° to the lower left of Saturn (Evening)
- 7 Fri Algol at minimum brightness for two hours centered on 8:12pm
- 8 Sat The Moon is ~4° to the lower right of Jupiter (Evening)
- 9 Sun Full Moon (1:55pm)**
- 12 Wed The Moon is ~3° to the lower right of the Pleiades, M45 (Evening)
- 14 Fri The Moon and Mars, separated by ~3°, rise in tandem in the ENE (Evening)
- 17 Mon The Moon is ~3° to the right of Pollux (Predawn)
- 17 Mon Last-Quarter Moon (10:15am)**
- 18 Tue The Moon in Cancer is ~5° above the Beehive Cluster, M44 (Predawn)
- 20 Thu The Moon and Regulus are separated by 4.5° in the east (Predawn)
- 20- Thu- The Orionid Meteor shower peaks in the predawn hours of the 21st (see p.48, October S&T)
- 24 Mon The Moon and Mercury rise in the ENE, though they are a challenging duo (Dawn)
- 25 Tue New Moon (3:49am)**
- 27 Thu The crescent Moon and Antares, separated by ~3°, sink toward the SW horizon (Dusk)
- 27 Thu Algol at minimum brightness for two hours centered on 9:53pm



The Summer Triangle's Hidden Treasures

By David Prosper

September skies bring the lovely **Summer Triangle** asterism into prime position after nightfall for observers in the Northern Hemisphere. Its position high in the sky may make it difficult for some to observe its member stars comfortably, since looking straight up while standing can be hard on one's neck! While that isn't much of a problem for those that just want to quickly spot its brightest stars and member constellations, this difficulty can prevent folks from seeing some of the lesser known and dimmer star patterns scattered around its informal borders. The solution? Lie down on the ground with a comfortable blanket or mat, or grab a lawn or gravity chair and sit luxuriously while facing up. You'll quickly spot the major constellations about the Summer Triangle's three corner stars: Lyra with bright star Vega, Cygnus with brilliant star Deneb, and Aquila with its blazing star, Altair. As you get comfortable and your eyes adjust, you'll soon find yourself able to spot a few constellations hidden in plain sight in the region around the Summer Triangle: **Vulpecula the Fox**, **Sagitta the Arrow**, and **Delphinus the Dolphin**! You could call these the Summer Triangle's "hidden treasures" – and they are hidden in plain sight for those that know where to look!

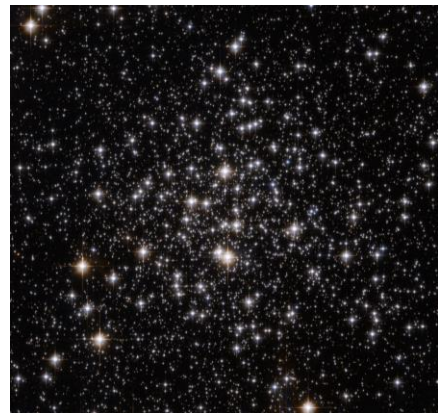


Caption: Search around the Summer Triangle to spot some of its hidden treasures! To improve readability, the lines for the constellations of Aquilla, Lyra, and Cygnus have been removed, but you can find a map which includes them in our previous article, *Spot the Stars of the Summer Triangle*, from August 2019. These aren't the only wonderful celestial sights found around its borders; since the Milky Way passes through this region, it's littered with many incredible deep-sky objects for those using binoculars or a telescope to scan the heavens. Image created with assistance from Stellarium: [stellarium.org](https://www.stellarium.org)

Vulpecula the Fox is located near the middle of the Summer Triangle, and is relatively small, like its namesake. Despite its size, it features the largest planetary nebula in our skies: M27, aka the Dumbbell Nebula! It's visible in binoculars as a fuzzy "star" and when seen through telescopes, its distinctive shape can be observed more readily - especially with larger telescopes. Planetary nebulae, named such because their round fuzzy appearances were initially thought to resemble

the disc of a planet by early telescopic observers, form when stars similar to our Sun begin to die. The star will expand into a massive red giant, and its gasses drift off into space, forming a nebula. Eventually the star collapses into a white dwarf – as seen with M27 - and eventually the colorful shell of gasses will dissipate throughout the galaxy, leaving behind a solitary, tiny, dense, white dwarf star. You are getting a peek into our Sun's far-distant future when you observe this object!

Sagitta the Arrow is even smaller than Vulpecula – it's the third smallest constellation in the sky! Located between the stars of Vulpecula and Aquila the Eagle, Sagitta's stars resemble its namesake arrow. It too contains an interesting deep-sky object: M71, an unusually small and young globular cluster whose lack of a strong central core has long confused and intrigued astronomers. It's visible in binoculars, and a larger telescope will enable you to separate its stars a bit more easily than most globulars; you'll certainly see why it was thought to be an open cluster!



Caption: M71 as seen by Hubble. This photo shows the cluster's lack of a bright, concentrated core, which led astronomers to classify this unusual cluster as an "open cluster" rather than as a "globular cluster." Studies in the 1970s proved it to be a globular cluster. Source: <https://www.nasa.gov/feature/goddard/2017/messier-71>

Delicate Delphinus the Dolphin appears to dive in and out of the Milky Way near Aquilla and Sagitta! Many stargazers identify Delphinus as a herald of the fainter water constellations, rising in the east after sunset as fall approaches. The starry dolphin appears to leap out of the great celestial ocean, announcing the arrival of more wonderful sights later in the evening.

Want to hunt for more treasures? You'll need a treasure map, and the Night Sky Network's "Trip Around the Triangle" handout is the perfect guide for your quest! Download one before your observing session at bit.ly/TriangleTrip. And of course, while you wait for the Sun to set - or skies to clear - you can always find out more about the objects and science hidden inside these treasures by checking out NASA's latest at 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 to find local clubs, events, stargazing info 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.