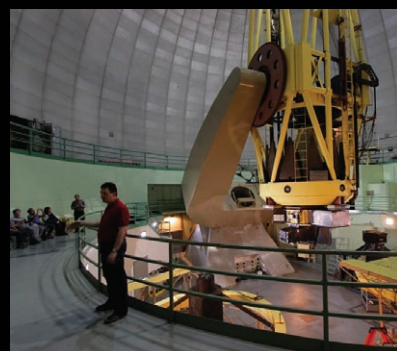


PRIMEFOCUS

Tri-Valley Stargazers



September 2016



Meeting Info

What:

The Evolution of the Reflector Telescope, Pt. 2

Who:

Dr. Kenneth Lum

When:

September 16, 2016
Doors open at 7:00 p.m.
Meeting at 7:30 p.m.
Lecture at 8:00 p.m.

Where:

Unitarian Universalist Church in Livermore
1893 N. Vasco Road

Inside

News & Notes	2
H2O Open House Report	2
Calendar of Events	2
Perseids 2016	5
What's Up	6
NASA's Space Place	7
Membership/Renewal Application	8

September Meeting

The Evolution of the Reflector Telescope, Pt. 2

Dr. Kenneth Lum

Dr. Ken Lum will give Part 2 of his presentation on the evolution of the reflecting telescope. In August he spoke about the invention of the reflecting telescope by Sir Isaac Newton in 1668, through to the development of large aperture reflectors in the 19th Century that were hampered by poor design. This month he will talk about the late 19th Century resurgence of the reflector as the primary tool for observational astronomy with the coming of the ability to apply high efficiency reflective coatings to glass mirrors, better ways to test the accuracy of their surfaces, and improved mechanical telescope mountings. He will discuss the history of the people who were most responsible for this change to the dominant telescope technologies used today.



Image Caption: Computer rendering of the Thirty Meter Telescope. Credit: Courtesy TMT Observatory Corporation (see: http://www.tmt.org/sites/default/files/images/gallery/top_view_of_tmt_complex.jpg)

Dr. Kenneth Lum is retired from the practice of Emergency Medicine. Since high school, he has also been an enthusiastic amateur astronomer, having built two telescopes at the Adler Planetarium in Chicago and a large Newtonian reflector when he reentered amateur astronomy in 1986. He pursued an interest in astronomical photography during the 1990s and continues to study the history of astronomy and astronomical instrumentation. Dr. Lum is currently interested in ways to enhance the performance of small telescopes with the use of a photomultiplier eyepiece and astronomical video cameras. Since 1994, he has been traveling with the Antique Telescope Society almost annually visiting different historical astronomical observatories.

News & Notes

2016 TVS Meeting Dates

The following lists the TVS meeting dates for 2016. The lecture meetings are on the third Friday of the month, with the Board meetings on the Monday following the lecture meeting.

Lecture Meeting	Board Meeting	Prime Focus Deadline
Sep. 16	Sep. 19	
Oct. 21	Oct. 24	Sep. 30
Nov. 18	Nov. 21	Oct. 28
Dec. 16	Dec. 19	Nov. 25

Money Matters

As of the last Treasurer's Report on 8/22/16, our club's checking account balance is \$13,069.85. Club membership has reached 100! Our club has not been this size since 2004.

Club Star Party

Saturday 9/24/16: Tesla Winery Star Party: This star party will be open to club members and their guests. The start and end times will be announced later, but we usually plan to arrive at the observing site about 30 minutes before sunset and wrap up around midnight. For those wishing to participate, each party will have a different observing theme. Suggestions include lunar features observing, planetary night, star cluster observing, beginner's night, and constellation identification. If you have an idea for another theme, please mention it to a board member during any meeting.

Outreach Star Party

Friday 9/02/16: The Muslim Community Center, Pleasanton: Eric Dueltgen is looking for volunteers to bring telescopes and/or binoculars. Information about the meeting time, etc., will be posted on the TVS Yahoo group.

About 25 people attended the successful August 27 H2O Open House. At dusk we were treated to the closest conjunction of Venus and Jupiter until November 2065. To the unaided eye they appeared as one, with Mercury a few degrees below. Saturn was astounding, exhibiting a pale salmon equatorial belt, and situated amongst 7 of its moons. Neptune exhibited a pale blue disk, with Triton visible nearby. With the Milky Way front and center, views of the Lagoon, Trifid, Swan, and Eagle Nebulae were shared, as were views of many Globular Clusters, including M13, which was near the zenith.



Caption: Mercury is nearly tucked in at the horizon, with Venus and Jupiter above-left. Credit: Ken Sperber

The night was calm, the seeing above average, and after the caravan headed back to town the fog came in at the coast, nearly shutting down the lights of San Jose and Livermore. This provided for a very dark sky, with my Sky Quality Meter reading 21.30 mag/(arc sec)². Near the zenith, the Veil nebula and the Dumbell Nebula showed incredible structure.

H2O Open House Report By K. Sperber



Caption: Participants setting up their telescopes at the August 27 TVS Open House. Credit: Ken Sperber

Calendar of Events

September 2, 6:00pm-10:00pm

What: \$5 First Fidays
Who: Chabot Staff
Where: Chabot Space and Science Center, 10000 Skyline Blvd., Oakland, CA 94619
Cost: \$5, Some events have limited capacity, book in advance

Admission includes:

- See the full sized replica of the NASA Mars Curiosity rover

Header Image: Resident Astronomer Paul Lynam lecturing during the TVS private tour of Lick Observatory. The 3-meter Shane Telescope is also seen. Image Credit: Gert Gottschalk

Calendar of Events (continued)

- One Digital Dome Planetarium Show (First come, first serve basis. We recommend arriving 10 - 20 minutes before the first show you are scheduled to see.)
- Access to interactive exhibits featuring Bill Nye's Climate Lab and the Touch the Sun exhibit
- Access to the Observatory Complex. Day & evening Telescope Viewing is available (Weather Permitting)

See <http://www.chabot.space.org/events.htm> for more information, or call (510) 336-7373.

September 6, 12:00pm

What: Triggering Big Bursts of Star Formation in Blue Compact Dwarf Galaxies
Who: Trisha Ashley, Bay Area Env Res Institute
Where: SETI Institute Colloquium, Microsoft Silicon Valley Campus (Galileo Room), 1065 La Avenida St., Mountain View, CA
Cost: Free

Dwarf galaxies tend to form stars inefficiently. Yet, blue compact dwarf (BCD) galaxies are a subset of dwarf galaxies that have intense and concentrated star formation (compared to typical dwarf galaxies). BCDs are thought to require a large disturbance to trigger their burst of star formation. A common theory is that the enhanced star formation in a BCD is the result of an interaction with another galaxy or a dwarf-dwarf galaxy merger. However, many BCDs are relatively isolated from other galaxies, making an interaction or a merger a less likely starburst trigger.

As part of the atomic hydrogen dwarf galaxy survey, LITTLE THINGS*, Dr. Ashley has studied the gaseous properties of six BCDs. Atomic hydrogen data allow us to explore the velocity fields and morphologies of the gas in BCDs, which may contain signatures of star formation triggers, such as gas consumption, a past merger, and interaction with previously undetected companions. If BCDs have formed through gas con-

sumption or dwarf-dwarf mergers, then they would be useful analogs for galaxy formation in the early universe. Also, learning which large disturbance has triggered the burst of star formation in BCDs could be useful for understanding and modeling how/whether BCDs evolve into/from other types of dwarf galaxies

For more information see: <http://www.seti.org/csc/lectures>, e-mail info@seti.org, or phone 650-961-6633.

September 10, 8:00pm

What: Shining Light on the Dark Side with Lasers and Atoms
Who: Dr. Holger Müller, UC Berkeley
Where: Mt. Tamalpais State Park, Cushing Memorial Amphitheater, more commonly known as the Mountain Theater, Rock Spring parking area
Cost: Free

Multiple lines of astronomical evidence demonstrate the existence of dark matter and dark energy — mysterious stuff whose gravity holds galaxies together and drives the accelerated expansion of the universe. Precision measurements in physics are suitable for searching for ultralight dark-sector candidates.

For more information see: <http://www.friendsofmountain.org/astronomy/schedule>

September 13, 12:00pm

What: Zombie Vortices in Protoplanetary Disks & Their Roles in Star and Planet Formation
Who: Phil Marcus, UC Berkeley
Where: SETI Institute Colloquium, Microsoft Silicon Valley Campus (Galileo Room), 1065 La Avenida St., Mountain View, CA
Cost: Free

The understanding of the early stages of planet formation from a disk of orbiting particles is an ongoing challenge for
 continued on page 4

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TVS E-Group

So how do you join the TVS e-group, you ask? Just send an e-mail message to the TVS e-mail address (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 (continued)

astrophysics and planetary science. Dr. Marcus will address the importance of instabilities in the particle disk as a link in the planetary formation chain.

Without instabilities, gas around a forming protostar remains in orbit, and the final star cannot form; dust grains cannot accumulate to form planets; and the compositions of meteorites cannot be explained. Unfortunately, the Keplerian motion within a disk is assumed by most astrophysicists to be stable by Rayleigh's theorem because the angular momentum of the disk increases with increasing radius.

Dr. Marcus will show that there is a new purely hydrodynamic instability that is violent and destabilizes the protoplanetary disk, filling it with turbulence. The essential ingredients of the new instability are rotation, shear, and vertical density stratification. When the initial perturbation is an isolated vortex, the vortex triggers a new generation of vortices at the nearby critical layers. After this second generation of vortices grows large, it triggers a third generation. The triggering of subsequent generations continues ad infinitum in a self-similar manner creating a 3D lattice of turbulent 3D vortices.

For more information see: <http://www.seti.org/csc/lectures>, e-mail info@seti.org, or phone 650-961-6633.

September 17, 11:00am

What: What Really Killed the Dinosaurs?

Who: Mark Richards, UC Berkeley

Where: UC Berkeley, 159 Mulford Hall (northwest corner of campus)

Cost: Free, limited hourly pay parking on/nearby campus. The venue is within walking distance of BART and bus lines.

The disappearance of the dinosaurs, along with 70% of all species in the fossil record, about 66 million years ago is widely attributed to the Chicxulub impact in Yucatán, Mexico — a discovery credited to a Berkeley team led by Walter and Luis Alvarez. However, at the same time, one of the largest volcanic eruptions in Earth history, the Deccan Traps, was occurring in India — a coincidence that has confounded geologists for three decades, and is made all the more remarkable since the four most recent mass extinctions in Earth history all correspond very closely in time to huge volcanic eruptions. Several new lines of evidence, including high-precision radioisotopic dating work at Berkeley, now suggest that the Chicxulub impact accelerated the Deccan Traps eruptions right at the time of the dinosaurs' extinction. It is therefore difficult to know whether T. rex and friends were exterminated mainly by the impact itself or by the impact-triggered Deccan eruptions, since both events would have affected the environment in similar ways. So the great murder mystery once considered "solved" by the impact theory will require further research to

sort out the true kill mechanisms for what appears to have been a double-edged catastrophe 66 million years ago.

For more information see: <http://scienceatcal.berkeley.edu/the-sciencecal-lecture-series/>

September 27, 12:00pm

What: Methane on Mars: potential origin and seepage

Who: Giuseppe Etiope Istituto Nazionale di Geofisica e Vulcanologia, Roma

Where: SETI Institute Colloquium, Microsoft Silicon Valley Campus (Galileo Room), 1065 La Avenida St., Mountain View, CA

Cost: Free

It is widely accepted that the occurrence of methane (CH₄) in the Martian atmosphere may imply the presence of active geological sources, i.e. gas emission structures in the Martian soil and subsoil. In other words, gas seepage, a process well known on Earth, should exist on Mars. The concept of gas seepage, although obvious for many geologists, especially those working in gas geochemistry and petroleum geology, is ignored or poorly known by Mars methane science community. The seminar will offer a discussion on the fundamentals of seepage, its potential occurrence on Mars (via microseepage, mud volcanoes, faults, degassing from serpentinized rocks) and possible detection techniques. Basic concepts on potential methane origin on Mars (biotic vs abiotic) will be discussed and clarified, considering some confusion and misinterpretations in present literature.

Giuseppe Etiope is a senior researcher, geologist, at the Istituto Nazionale di Geofisica e Vulcanologia in Rome, Italy. He works on the origin, occurrence, and migration of gas in the geosphere, with particular reference to biotic hydrocarbons in sedimentary basins and abiotic gas in serpentinized ultramafic rocks. He studies the origin of methane, gas seepage phenomena and their implications for the environment, energy resource exploration and planetary geology (methane on Mars). He published 164 articles and a Springer's book on "Natural Gas Seepage". H index: 27 (Web of Science); 32 (Google Scholar).

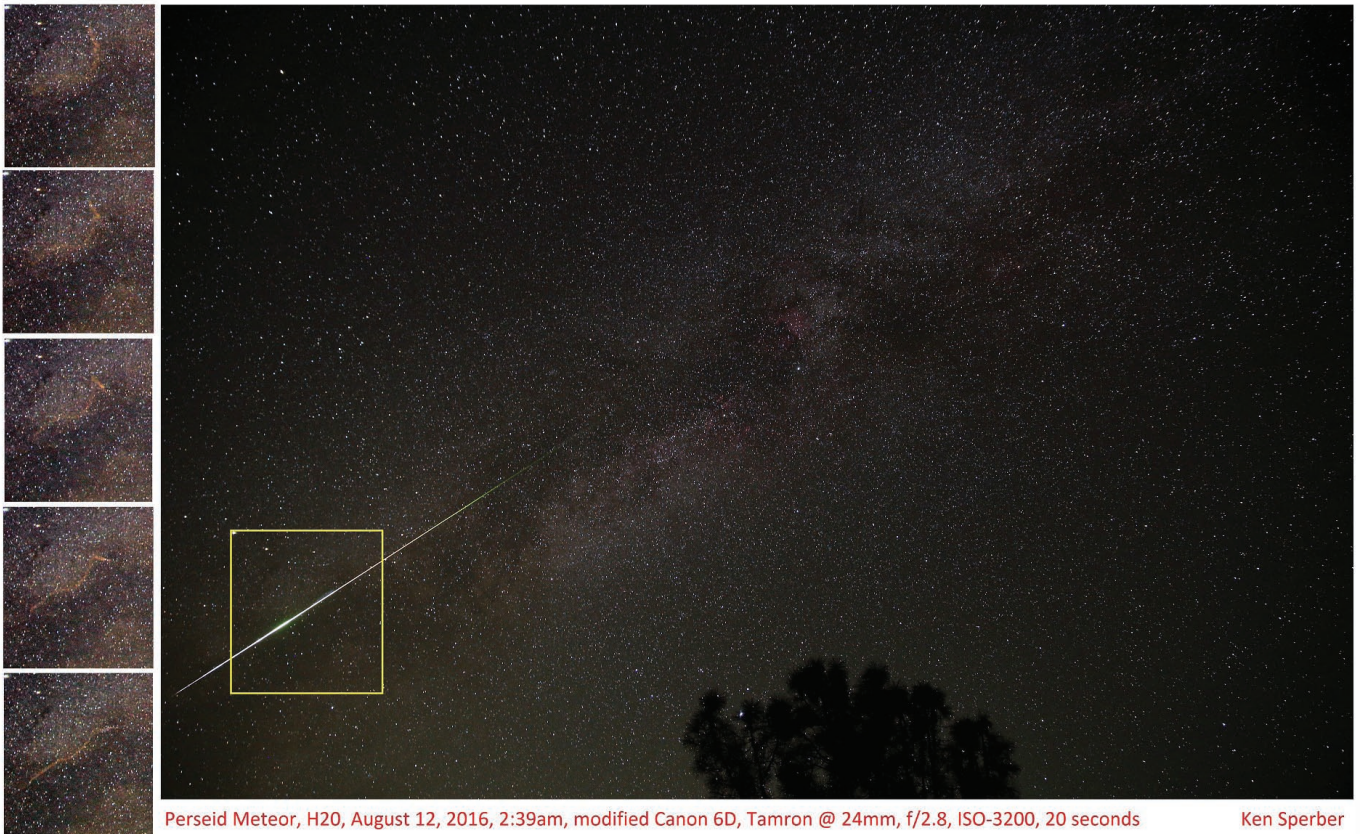
For more information see: <http://www.seti.org/csc/lectures>, e-mail info@seti.org, or phone 650-961-6633.

2016 Perseids

Ken Sperber took these images of the Perseid Meteor shower on August 12, 2016 from H2O.

Right: A composite of 14 images taken between ~1:30am-4:30am, shows the radiant of the Perseids. The meteor trails point back toward the vicinity of the Double Cluster. The Andromeda Galaxy is to the upper-right of center. Canon 6D with Astronomik light pollution filter, Sigma 24mm, f/1.4, ISO-3200, 15 seconds.

Below: A bright meteor split the Milky Way in half. The North America Nebula is to the upper-right of center. A smoky trail was visible to the unaided eye for about 30 seconds. The insets, which cover the area of the yellow box, show the smoky trail in five subsequent 20 second photos (bottom to top). Modified Canon 6D, Tamron @ 24mm, f/2.8, ISO-3200, 20 seconds.



Perseid Meteor, H2O, August 12, 2016, 2:39am, modified Canon 6D, Tamron @ 24mm, f/2.8, ISO-3200, 20 seconds

Ken Sperber

What's Up By Ken Sperber (adapted from S&T and The Year in Space)

All times are Pacific Daylight Time.

September

- 1 Thu **New Moon (2:03am)**
- 4 Sun Spica is ~5 degrees to the lower-left of the thin crescent Moon (Dusk)
- 8 Thu Saturn (Mars) within 4 degrees (9 degrees) of the Moon (Evening)
- 9 Fri **First-Quarter Moon (4:49am)**
- 16 Fri **Full Moon (12:05pm)**
- 22 Thu Autumn begins in the Northern Hemisphere (7:21am)
- 23 Fri **Last-Quarter Moon (2:56am)**
- 23 Fri Algol at minimum brightness for 2 hours centered at 8:19pm
- 28 Wed Zodiacal light visible in the east, rising through Leo, Cancer, and Gemini, before dawn from dark locations
- 29 Thu Low in the east, use binoculars to see Mercury about 2 degrees above the thin crescent Moon (30-40 minutes before sunrise)
- 30 Fri **New Moon (5:11pm)**

October

- 3 Mon Crescent Moon 4 degrees above Venus (Dusk)
- 5 Wed Saturn about 6 degrees left of the Moon, with Antares about 6 degrees below (Evening)
- 8 Sat **First-Quarter Moon (9:33pm)**
- 13 Thu Algol at minimum brightness for 2 hours centered at 10:00pm
- 15 Sat **Full Moon (9:23pm)**
- 20-22 Thu- The modest Orionid meteor shower peaks the morning of the 21st, but the Moon will wash out the radiant
- 22 Sat **Last-Quarter Moon (12:14pm)**
- 25 Tue The crescent Moon rises just after Regulus (predawn)
- 26 Wed Saturn about 5 degrees to the upper-left of Venus in the southwest (dusk)

Is there a super-Earth in the Solar System out beyond Neptune?

By Dr. Ethan Siegel

When the advent of large telescopes brought us the discoveries of Uranus and then Neptune, they also brought the great hope of a Solar System even richer in terms of large, massive worlds. While the asteroid belt and the Kuiper belt were each found to possess a large number of substantial icy-and-rocky worlds, none of them approached even Earth in size or mass, much less the true giant worlds. Meanwhile, all-sky infrared surveys, sensitive to red dwarfs, brown dwarfs and Jupiter-mass gas giants, were unable to detect anything new that was closer than Proxima Centauri. At the same time, Kepler taught us that super-Earths, planets between Earth and Neptune in size, were the galaxy's most common, despite our Solar System having none.

The discovery of Sedna in 2003 turned out to be even more groundbreaking than astronomers realized. Although many Trans-Neptunian Objects (TNOs) were discovered beginning in the 1990s, Sedna had properties all the others didn't. With an extremely eccentric orbit and an aphelion taking it farther from the Sun than any other world known at the time, it represented our first glimpse of the hypothetical Oort cloud: a spherical distribution of bodies ranging from hundreds to tens of thousands of A.U. from the Sun. Since the discovery



of Sedna, five other long-period, very eccentric TNOs were found prior to 2016 as well. While you'd expect their orbital parameters to be randomly distributed if they occurred by chance, their orbital orientations with respect to the Sun are clustered extremely narrowly: with less than a 1-in-10,000 chance of such an effect appearing randomly.

Whenever we see a new phenomenon with a surprisingly non-random appearance, our scientific intuition calls out for a physical explanation. Astronomers Konstantin Batygin and Mike Brown provided a compelling possibility earlier this year: perhaps a massive perturbing body very distant from the Sun provided the gravitational "kick" to hurl these objects towards the Sun. A single addition to the Solar System would explain the orbits of all of these long-period TNOs, a planet about 10 times the mass of Earth approximately 200 A.U. from the Sun, referred to as Planet Nine. More Sedna-like TNOs with similarly aligned orbits are predicted, and since January of 2016, another was found, with its orbit aligning perfectly with these predictions.

Ten meter class telescopes like Keck and Subaru, plus NASA's NEOWISE mission, are currently searching for this hypothetical, massive world. If it exists, it invites the question of its origin: did it form along with our Solar System, or was it captured from another star's vicinity much more recently? Regardless, if Batygin and Brown are right and this object is real, our Solar System may contain a super-Earth after all.

This article is provided by NASA Space Place. With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology. Visit spaceplace.nasa.gov to explore space and Earth science!



Image caption: A possible super-Earth/mini-Neptune world hundreds of times more distant than Earth is from the Sun. Image credit: R. Hurt / Caltech (IPAC)



Tri-Valley Stargazers
P. O. Box 2476
Livermore, CA 94551
www.trivalleystargazers.org

Tri-Valley Stargazers Membership Application

(or apply for membership online: www.trivalleystargazers.org/membership.shtml)

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 (\$5). Must be a full-time high-school or college student.

Regular member (\$30).

Patron member (\$100). Patron membership grants use of the club's 17.5" reflector at H2O. You must be a member in good standing for at least one year, hold a key to H2O, and receive board approval.

Hidden Hill Observatory Access (optional):

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.

Magazine Subscriptions (optional): Discounted subscriptions are available only to new subscribers. All subsequent renewals are handled directly with the magazine publishers.

One-year subscription to Sky & Telescope magazine (\$32.95).

One-year subscription to Astronomy magazine (\$34).

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 other than other club members and the Astronomical League without your express permission.

Mail this completed form along with a check to: Tri-Valley Stargazers, P.O. Box 2476, Livermore, CA 94551.