PRIMEFOCUS

Tri-Valley Stargazers

October 2015

Meeting Info

What:
Not Quite Alone in a Sea of Stars

Who:
Prof. Eric W. Harpell

When:
October 16, 2015
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

October Meeting

Not Quite Alone in a Sea of Stars
Prof. Eric W. Harpell

With the recent "buzz" surrounding our recent visits to Pluto, Ceres, and the discovery of surface water on Mars, just as "the Martian" hit the big screen, it is an opportune time to reflect on what we have learned in recent years about our place in the solar system, and our relationship to the tens of billions of other worlds now considered to be our likely neighbors in the Milky Way. In this talk, Eric Harpell will lead us on an exploration of our nearest and farthest neighbor words—some seen in detail for the first time—and compare them to the myriad of new planets revealed anew each year through analysis of Kepler space telescope data. Finally, we will explore what this data has shown us about planetary habitability, and what perspective this brings to our prospects and strategies for survival here at home.

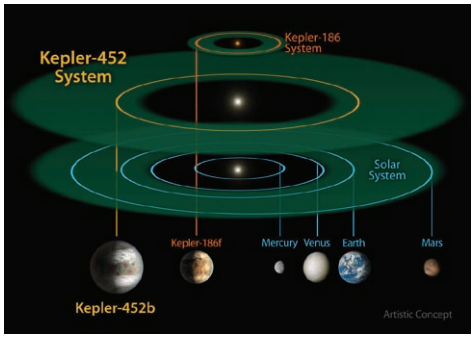

Image Caption: This size and scale of the Kepler-452 system compared alongside the Kepler-186 system and the solar system. Credit: NASA Ames/JPL-CalTech/R. Hurt

For the past 27 years, Eric Harpell has been a professor of Astronomy and Physics at Las Positas College here in Livermore, CA. Lately, he has also taught Energy and Sustainability, as part of the Environmental Science/Environmental studies program he initiated on campus in 2012. A graduate of UC San Diego and UCLA, Eric has also done research in high energy physics at SLAC, and been a guest observer at the Keck Telescope in Hawaii and the VLT and European Southern Observatories in Chile.

Although he remains current in astronomical technology, planetary science, and exo-planet detection, Eric's primary interests and responsibilities center on bringing an astronomical perspective to students in a wide variety of science courses. He is currently at work on a book integrating astronomy, physics, and environmental science.

This past year, Eric teamed up with LLNL atmospheric scientist Jeff Miroca to talk about the need for "Green Energy" at the March 2015 Science on Saturday presentation at the Bankhead theater in Livermore, and again in May at Las Positas College's "How science gets done" speaker series. Outside of his research and teaching interests in astronomy in physics, Eric remains an avid stargazer, and has hosted star parties yearly at elementary and high schools in Livermore and Pleasanton.

News & Notes

2015 and 2016 TVS Meeting Dates

The following lists the TVS meeting dates for 2015. 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**
Oct. 16	Oct. 19	
Nov. 20	Nov. 23	Oct. 30
Dec. 18	Dec. 21	Nov. 27
Jan. 15	Jan. 18	Dec. 25
Feb. 19	Feb. 22	Jan. 29
Mar. 18	Mar. 21	Feb. 26
Apr. 15	Apr. 18	Mar. 25
May 20	May 23	Apr. 29
Jun. 17	Jun. 20	May 27
Jul. 15	Jul. 18	Jun. 24
Aug. 19	Aug. 22	Jul. 29
Sep. 16	Sep. 19	Aug. 26
Oct. 21	Oct. 24	Sep. 30
Nov. 18	Nov. 21	Oct. 28
Dec. 16	Dec. 19	Nov. 25

Money Matters

As of September 21, 2015 the TVS checking account balance is $11,520.67.

H2O: The Jack Marling Scope is Operational!

The Jack Marling telescope is operational again, so the TVS board has decided to re-open patron memberships starting next year. They decided to increase the cost for a patron membership from $70.00 annually to $100.00. The criteria for patron membership have not changed.

TVS is considering additional upgrades to the telescope. As such, we currently are seeking input from users and potential users on the requirements for the focuser. Issues include how much does your equipment weigh, what clear/unvignetted aperture do you need/wish for, and what is the back focus requirements of your camera. Perhaps this can be conducted on this forum, or we may elect to get together and brainstorm. The focuser needs to meet the needs of both eyepiece users and astrophotographers, so input from all users is welcome. Please respond to Rich Combs at: trivalleystargazers "at"yahoogroups.com

TVS Star Parties at Tesla Winery: October 17 (6:00pm-Midnight)

TVS will hold a star party at Tesla Vintners in Livermore! Tesla Vintners is located on Tesla Road near Mines Road, and it has reasonably dark skies overhead and to the south, considering its urban location. The winery is private property, and we are the guests of Steve Powell, the owner. *These star parties are only open to current club members and their guests.*

The winery has two entrances. The main entrance is likely to be closed, so plan on using the unmarked delivery entrance, the one closer to Mines Road. The winery has a large parking area in the middle of the grounds plus a large open field in the back. We are welcome to use both, but lights from the Wente winery to the east can be a problem in the back. The winery also has a bathroom which we will be able to use. The star party will run through midnight.

Normal star party etiquette applies, so no bright lights, no dogs, no loud music, and definitely no smoking or fires.

Star Party, Friday Oct. 23: Volunteers Needed

Eric Dueltgen, the TVS Star Party Coordinator, requests volunteers to assist with an upcoming star party at the Valley Christian School in Dublin. Please contact Eric if you wish to participate in this outreach effort (coordinator"at"trivalleystargazers.org)

Calendar of Events

October 10, 10:00am-4:00pm

What: Universe 2015
Who: You
Where: Chabot Space and Science Center, 10000 Skyline Blvd., Oakland, CA 94619
Cost: Free with general admission. call (510) 336-7373

Spend the day exploring the cosmos and learning about planets, dwarf planets, and exoplanets from world renowned experts. Delve deeper into all aspects of astronomy through our interactive exhibits, planetarium shows, telescopes, hands-on activities and a special astrophotography exhibit.

Presented by the Astronomical Society of the Pacific in partnership with Chabot Space and Science Center. See http://www.chabotspace.org/events.htm for more information, or call (510) 336-7373.

October 13, 12:00pm

What: Astrochemistry: Putting the Astro in Astrobiology
Who: Alexander Tielens, University of Leiden
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

Astrobiology, the study of emergence of life and the its distribution in the Universe, addresses the most fundamen-

Header Image: Dave Lackey, Jill Evanko, Don Dossa, Chuck Grant and Roland Albers (who took the picture) were the TVS star party volunteers who participated on the Oct. 2 outreach event for the Pleasanton Recreational Activities for the Developmentally Disabled.

tal questions in science: "How does life begin ?" and "Are we alone ?" Over the last 20 years, we have discovered that planets are bountiful in the galaxy and that one in every five solar-type stars has a planet in the habitable zone. We have learned that extremophiles have spread to essential every niche – even the seemingly most inhospitable ones – on our planet. The focus in this talk will be on astrochemistry – the starting point of astrobiology – the chemical evolution that takes place in space where simple molecules are transformed into complex molecules and complex molecules are broken down to simple ones. This chemical dance of the elements produces a wide variety of organic compounds. I will review the processes that drive this chemical evolution in space, particularly in regions of star and planet formation. The focus will be on understanding the raw materials that are delivered to newly formed planets and their relationship to the building blocks from which prebiotic material was formed and biological systems evolve.

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

October 17, 11:00am

What: Stardust: Analyses of Cometary and Interstellar Dust
Who: Andrew Westphal
Where: UC Berkeley, Genetics and Plant Biology Building, Room 100 (northwest corner of campus)
Cost: Free, limited hourly pay parking on/nearby campus. The venue is within walking distance of BART and bus lines.

Stardust was the first spacecraft ever to bring back to Earth extraterrestrial materials from beyond the Moon. It was two missions in one spacecraft. Stardust returned the first samples from a known primitive solar system body, the Jupiter-family comet Wild 2. Stardust also carried a separate collector that was exposed the interstellar dust stream for 200 days before the encounter with the comet. These tiny rocks — a trillion would fit into a teaspoon — were identified in the returned collector by a small army of more than 30,000 citizen scientists, through a project called Stardust@home. Dr. Westphal will present results of laboratory analyses of samples from both collectors, including laboratory analyses of seven particles that are likely the first individual rocks from the local interstellar medium ever identified.

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

October 17, 7:30pm

What: Prospects and Hunting for Intelligent Life in the Universe
Who: Dr. Geoff Marcy, UC Berkeley
Where: Mt. Tamalpais State Park, Cushing Memorial Amphitheater, more commonly known as the Mountain Theater, Rock Spring parking area
Cost: Free

Not one microbe has been found anywhere in the universe, except on Earth, nor have any intelligent civilizations been found. Is our Galaxy teeming with life, as suggested by science fiction, or might intelligent life be rare in the Milky Way Galaxy? New telescopes and techniques can answer these questions.

For more information see: http://www.friendsofmttam.org/astronomy/schedule

October 20, 12:00pm

What: Are Old Galaxies Really Red and Dead?
Who: Leo Blitz, UC Berkeley
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

Details not available.

For more information see: http://www.seti.org/csc/lectures,

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Calendar of Events (continued)

e-mail info@seti.org, or phone 650-961-6633.

October 27, 12:00pm

What: Checking on the Neighbors: Searching for Planets around Alpha Centauri
Who: Michael Endl, UT Austin
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

No details available.

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

November 3, 12:00pm

What: Shape Dynamics: A Relational View of the Universe
Who: Henrique Gomes, Perimiter Institute
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

Shape Dynamics is a new theory of gravity which removes the notion of local relativistic time from the guiding principles of gravity in the universe. It is a very promising approach which has been shown to be equivalent to Einstein's Theory of General Relativity, without being embedded in time. It is inspired by adherence to Mach's Principle, which is violated by Einstein's theory. Shape Dynamics provides new tools in the quest for a theory that describes quantum gravity. In the first part of the talk Dr. Gomes will review some of the Machian motivations for shape dynamics and sketch its construction. In the second half, Dr. Gomes will talk about recent developments on black holes in this formulation, and discuss some positive aspects of its ongoing quantization program.

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

November 9, 7:30pm

What: The Universe in a Box
Who: Tom Abel, Director, Kavli Institute for Particle Astrophysics and Cosmology, Stanford University
Where: California Academy of Science, 55 Music Concourse Dr., Golden Gate Park, San Francisco, CA
Cost: Advanced ticketing required. Academy members $8 , Seniors $10, General $12. Reserve a space online or call 1-877-227-1831.

What was the first thing in the Universe? A black hole or a star? How did it form? Even our biggest and best telescopes cannot tell us. Direct calculation with supercomputers, however, can. The first luminous objects in the Universe were very massive stars shining one million times as brightly as our sun. They died quickly and seeded the cosmos with the chemical elements necessary for life. One star at a time, galaxies started to assemble just one hundred million years after the Big Bang, and they are still growing now. Join Dr. Abel in a fascinating journey through the early universe, where he uses the latest computer animations of early star formation, supernovae explosions and the buildup of the first galaxies. The calculations combine the physics of dark matter, of atoms and molecules, the expansion of the Universe, chemistry, and gas dynamics to make remarkable predictions of our past.

See www.calacademy.org/events/benjamin-dean-astronomy-lectures for lecture and reservation information.

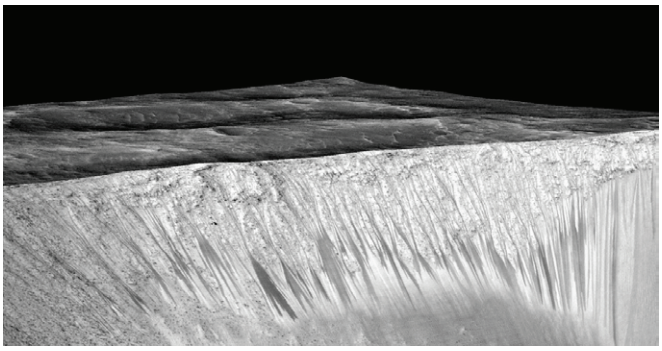
Ken Sperber took this (cropped) image of the September 27, 2015 lunar eclipse at 8:33pm, about 10 minutes after totality ended. It was taken with a Canon 6D using a 70-200mm lens set to 200mm f/4.5 for 1.6 seconds at ISO-200. From Dublin, most of the total eclipse was clouded out. But patience paid off, when the Moon finally made its appearance at about 8:14pm.

The orange shadow is due to sunlight that has filtered through the Earth's troposphere. Blue light in the troposphere gets scatted by air molecules, with the red light passing through. The narrower blue band to the lower-left is light that has passed through the Earth's stratosphere, where ozone absorbs the red light.

Journal Club By Ken Sperber

Water, Water, Everywhere

What a week! First the detection of water on Mars, and then the finding that there may be more water on the Moon than thought. Who'd a thunk it?



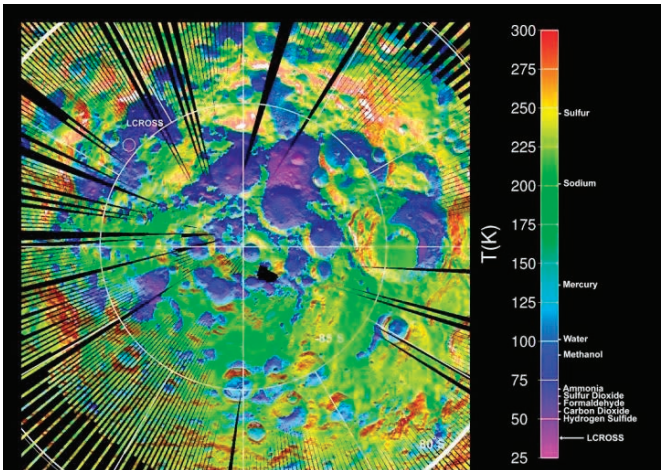
Caption: The dark narrow streaks are recurring slope lineae (RSL) on the walls of Garni Crater on Mars. The RSL's are up to a few hundred meters in length. The image was obtained by the Mars Reconnaissance Orbiter HiRISE camera. Here the image is seen draped over a digital terrain model with 1.5x vertical exaggeration. Credit: NASA/JPL/University of Arizona

Mars: Recurring slope lineae (RSL) have been found at dozens of locations on Mars. Detecting such narrow features requires an exquisite camera, such as HiRISE (High Resolution Imaging Science Experiment) on the Mars Reconnaissance Orbiter (MRO), which has been in orbit around Mars since 2006. As such, MRO has observed Mars though 5+ Martian years and has thus been able to document recurring changes that arise due to the passage of the seasons. RSL's originate in the spring and summer on Sun facing slopes, where they appear as dark streaks. They only appear when the local temperature is above -10 degrees Fahrenheit. During autumn and winter the RSL's fade and may disappear.

The narrowness of the RSL's made them difficult to analyze with CRISM, the Compact Reconnaissance Imaging Spectrometer for Mars that is also on the MRO. The spectra from CRISM are used to detect the Martian mineralogy. From analyzing RSL's that were "relatively wide" and comparing to the same location when the RSL's were not as extensive, hydrated salts have been found. These briny mixtures are composed of magnesium perchlorate, magnesium chlorate, and sodium perchlorate. In sufficient quantity, these dissolved salts allow water to remain liquid at temperatures as cold as -94 degrees Fahrenheit. So, while images of canyons and riverbed features from space and clays identified by landers have provided evidence of ancient water on Mars, these results indicate that water is actively flowing on Mars today! The ramifications of these results are huge, as any microbial life that may have developed on Mars in the distant past could still exist underground, today. Furthermore, the fact that these features recur year after year means that we can plan a sample return mission with high confidence that a pristine wet subsurface sample would be obtained. From the point of view of a manned mission to Mars, access to water makes such a mission much more viable and sustainable.

For more information see: http://www.jpl.nasa.gov/news/news.php?feature=4722

The Moon: The Moon was once thought to be bone dry with the strong solar radiation believed to have boiled off any nascent water. However, in the 1990's the Lunar Prospector probe found an abundance of hydrogen, that could be interpreted as water, in craters near the north and south poles of the Moon. Some of these craters, seen in the dark blue/purple colors in the temperature plot below, are oriented such that sunlight never falls on them. Such locations act as "cold traps" where water delivered from comets and asteroids would permanently freeze out. Some years ago the NASA LCROSS mission crashed a rocket body into one of the cold trap craters, and water was directly detected by a trailing satellite-WooHoo!



Caption: Temperature map of the South Pole of the Moon from the Lunar Reconnaissance Orbiter. Credit: NASA

However, there is more to the story since the Lunar Reconnaissance Orbiter (LRO) found that not all cold traps contained water, and water was also found in regions exposed to sunlight! In the sunlit locations the suggestion is that a thin layer of soil acts as a blanket to retain the water. One possible source of water is the solar wind, with the solar hydrogen reacting with oxygen in the soil to produce water and create water bearing minerals. Comets and asteroids are also hypothesized to be a source of water deposition. To study the relative contributions of water from comets and asteroids Svetsov and Shuvalov (2015) used a numerical model to simulate impacts of comets and asteroids into the lunar surface. Carbonaceous Chondrites, the most common type of asteroid, can be up to 10% water, with the water locked up in minerals. The simulations indicate that >99% of the water in comets is vaporized, with the remain-

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

All times are Pacific Daylight Time until Nov. 1, then Pacific Standard Time.

October

11-25	Sun-	Zodiacal light visible in the east 1-2 hours before sunrise. Venus, Mars, and Jupiter visible at the base.
12	Mon	New Moon (5:06pm)
12	Mon	Algol at minimum brightness for 2 hours centered on 10:01pm
15	Thu	Algol at minimum brightness for 2 hours centered on 9:50pm
17-18	Sat	Mars less than 1/2 degree from Jupiter (dawn(
20	Tue	First-Quarter Moon (1:31pm)
21-22	Wed	Orionid meteor shower, best in the predawn hours
24-26	Sat-	Venus, Jupiter, and Mars shine above the eastern horizon (dawn)
27	Tue	Full Moon (5:05am)

November

1	Sun	Daylight Savings Time ends (turn clock back 1 hour)
2-4	Mon-	Venus and Mars less than 1 degree apart; Jupiter 6 degrees to their upper-right (dawn)
3	Tue	Last-Quarter Moon (4:24am)
4	Wed	Algol at minimum brightness for 2 hours centered on 7:32pm
7	Sat	The crescent Moon, Venus, and Mars form a triangle with Jupiter 11 degrees above (dawn)
11	Wed	New Moon (9:47am)
17-18	Tue	Leonid Meteor Shower; best after midnight
18	Wed	First-Quarter Moon (10:27pm)
24	Tue	Algol at minimum brightness for 2 hours centered on 9:15pm
25	Wed	Full Moon in the Hyades star cluster (2:44pm)
28	Sat	Spica less than 5 degrees from Venus

ing portion mixing with lunar material. However, in the case of asteroids, more than half of the water, in the from of hydrated minerals, is deposited on the Moon since much of the asteroid is never sufficiently heated to vaporize the water. These asteroid fragments survive and are embedded in the crater. One of the conclusions is: "One impact of a 2-km diameter highly hydrated asteroid at a low velocity near the lunar pole can produce more water on the crater floor than all cometary impacts in cold traps" over the period of 1 billion years!

Cold drink, anyone?

For more information, sse: http://www.sciencedaily.com/releases/2015/09/150930110427.htm

Solar Wind Creates—and Whips—a Magnetic Tail Around Earth

By Dr. Ethan Siegel

As Earth spins on its axis, our planet's interior spins as well. Deep inside our world, Earth's metal-rich core produces a magnetic field that spans the entire globe, with the magnetic poles offset only slightly from our rotational axis. If you fly up to great distances, well above Earth's surface, you'll find that this magnetic web, called the magnetosphere, is no longer spherical. It not only bends away from the direction of the sun at high altitudes, but it exhibits some very strange features, all thanks to the effects of our parent star.

The sun isn't just the primary source of light and heat for our world; it also emits an intense stream of charged particles, the solar wind, and has its own intense magnetic field that extends much farther into space than our own planet's does. The solar wind travels fast, making the 150 million km (93 million mile) journey to our world in around three days, and is greatly affected by Earth. Under normal circumstances, our world's magnetic field acts like a shield for these particles, bending them out of the way of our planet and protecting plant and animal life from this harmful radiation.

But for every action, there's an equal and opposite reaction: as our magnetosphere bends the solar wind's ions, these particles also distort our magnetosphere, creating a long magnetotail that not only flattens and narrows, but whips back-and-forth in the onrushing solar wind. The particles are so diffuse that collisions between them practically never occur, but the electromagnetic interactions create waves in Earth's magnetosphere, which grow in magnitude and then transfer energy to other particles. The charged particles travel within the magnetic field toward both poles, and when they hit the ionosphere region of Earth's upper atmosphere, they collide with ions of oxygen and nitrogen causing aurora. Missions such as the European Space Agency and NASA Cluster mission have just led to the first accurate model and understanding of equatorial magnetosonic waves, one such example of the interactions that cause Earth's magnetotail to whip around in the wind like so.

The shape of Earth's magnetic field not only affects aurorae, but can also impact satellite electronics. Understanding its shape and how the magnetosphere interacts with the solar wind can also lead to more accurate predictions of energetic electrons in near-Earth space that can disrupt our technological infrastructure. As our knowledge increases, we may someday be able to reach one of the holy grails of connecting heliophysics to Earth: forecasting and accurately predicting space weather and its effects. Thanks to the Cluster Inner Magnetosphere Campaign, Van Allen Probes, Mars Odyssey Thermal Emission Imaging System, Magnetospheric Multiscale, and Heliophysics System Observatory missions, we're closer to this than ever before.

Kids can learn about how solar wind defines the edges of our solar system at NASA Space Place. http://spaceplace.nasa.gov/interstellar

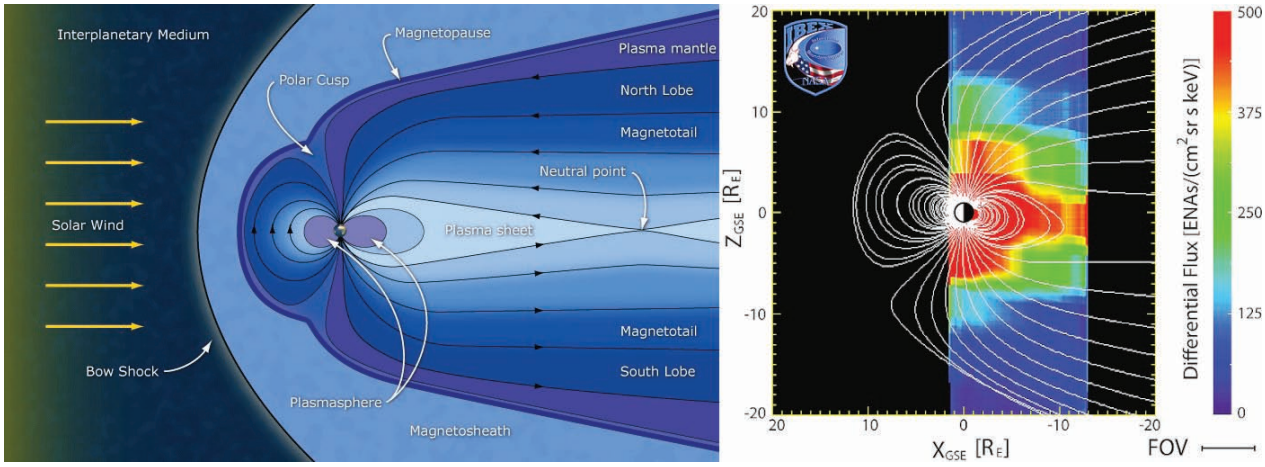

Image credit: ESA / C. T. Russell (L), of Earth's magnetic tail and its cause: the solar wind; Southwest Research Institute / IBEX Science Team (R), of the first image of the plasma sheet and plasmasphere created around Earth by the solar wind.

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.