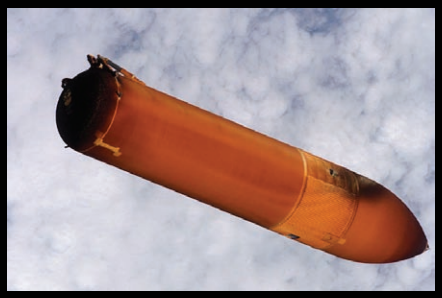
PRIMEFOCUS

Tri-Valley Stargazers



June 2015

Meeting Info

What:
Space Debris

Who:
Dr. Wim De Vries, LLNL

When:
June 19, 2015
Doors open at 7:00 p.m.
Meeting at 7:30 p.m.
Lecture at 8:00 p.m.

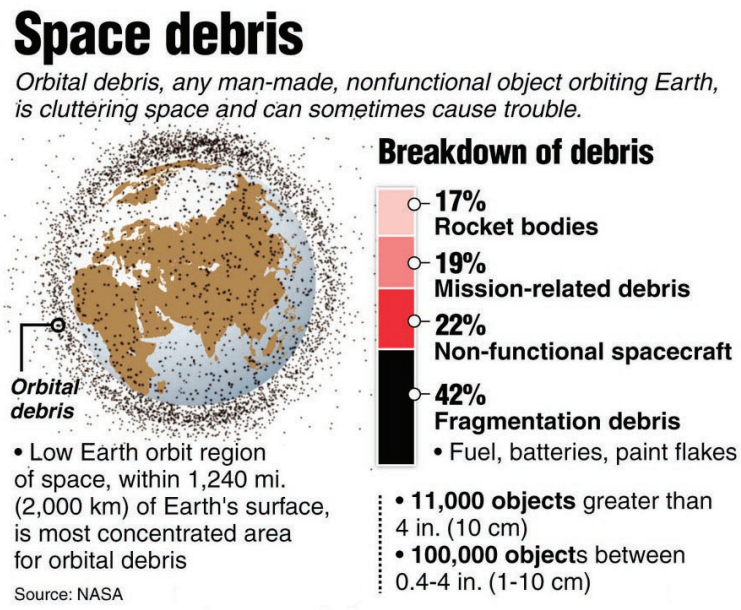
Where:
Unitarian Universalist
Church in Livermore
1893 N. Vasco Road

Inside

June Meeting

Space Debris
Dr. Wim De Vries

LLNL has been working for the last few years on ways to mitigate the space flight safety problems caused by orbital debris in low Earth orbits. Anyone who has seen the recent movie 'Gravity' will have a sense of what is at stake. While the movie does not paint an accurate picture of the problem, it is clear that something has to be done. LLNL tries to reduce the creation of new debris by providing better collision warning. This can be achieved through targeted observations of objects that are potential collision risks in the near future. In the talk I will discuss how this can be done with modest equipment from the ground, as well as with very small satellites from space. The practical aspects of observing space debris, the imaging results, and the overall orbital refinement quality will be covered in some detail.



Dr. De Vries received his Ph.D. in Astronomy (1999) from the University of Groningen, The Netherlands, after spending 3 years at the Space Telescope Science Institute (Baltimore, MD) as part of his thesis research on host galaxies of powerful extragalactic radio sources. He was hired by the Lawrence Livermore National Laboratory as a postdoctoral fellow in 1999, and after spending several years as a project scientist at the University of California, Davis, is now a staff physicist at LLNL working on Space Situational Awareness.

News & Notes

2015 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**
Jun. 19	Jun. 22	
Jul. 17	Jul. 20	Jun. 26
Aug. 21	Aug. 24	Jul. 31
Sep. 18	Sep. 21	Aug. 28
Oct. 16	Oct. 19	Sep. 25
Nov. 20	Nov. 23	Oct. 30
Dec. 18	Dec. 21	Nov. 27

Money Matters

As of May 18, 2015 the TVS checking account balance is $13,824.74. With the addition of 3 new members last month, our total membership is now up to 80, already surpassing last year's end-of-year total! Anyone with family and friends interested in astronomy is encouraged to invite them to become members and join in on our club meetings, star parties, and outreach efforts.

TVS Loaner Scope Program Enhancement

The club has purchased a new telescope for our loaner program: an Orion SkyQuest XT8i IntelliScope, an 8-inch Dobsonian telescope with a push-to controller (see http://www.telescope.com/Telescopes/Dobsonian-Telescopes/IntelliScope-Dobsonians/Orion-SkyQuest-XT8i-IntelliScope-Dobsonian-Telescope/pc/1/c/12/sc/27/p/102012.uts).

The scope made its debut at the May 9 Open House and performed admirably. We'll have the XT8i available for viewing during our next club meeting on Friday 6/19/15 and then again the next evening at the Tesla Star Party. After that, the scope will be available for rental at our usual $15/month, but because of its value it will require a $100 deposit.

H2O: The Jack Marling Scope is Back!

The Jack Marling 17.5-inch telescope is back up and running at H2O. Chuck and Roland reinstalled it on May 6, and it went back into service for the first time at the H2O Open House on May 9. The mount is non-motorized for now, but it moves smoothly by hand and any vibrations now seem to dampen quickly. Those of us attending the Open House were treated to outstanding views of spiral galaxy M51 and globular cluster M3.

TVS Tesla Winery Star Parties (8pm-Midnight): June 20, July 18, September 19, & October 17

TVS will hold numerous star parties 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.

TVS Yosemite Star Party: July 17-18

Bob McKoon will be coordinating this year's TVS star party at Glacier Point, Yosemite National Park. We were lucky in drawing the nearly-new Moon weekend of July 17-18. TVS members who bring telescopes for public observing will receive free camping at the Bridalveil campgrounds. The Moon, with ~6% of the disk visible, will set by 10pm. On these dates sunset occurs at about 8:25pm with sunrise at about 6:00am. Contact Bob for more information (rmckoon"at"yahoo.com).

Star Party, Volunteers Needed: Tuesday, July 28

The Girl Scouts Camporee astronomy night at the Alameda County Fairgrounds in Pleasanton is from 8:00 to 10:00pm. There will be approximately 400 participants, so we need lots of TVS volunteers. Contact Eric Dueltgen, the TVS Star Party Coordinator if you can be of assistance (coordinator"at"trivalleystargazers.org).

TVS H2O Open House: August 8

The next TVS Open House at H2O is Saturday, August 8. Interested club members, especially those who have paid a key deposit but have not yet completed an orientation visit, are encouraged to attend. We will meet at the corner of Mines Rd. and Tesla Rd., and depart to H2O at 6:30pm in a caravan led by Chuck Grant. Admission is $3/car; please bring the exact amount. The site is primitive, with 2 pit toilets, and no running water. Bring warm clothes, and food and water for the evening. Use a flashlight with a red filter so that people's dark adaptation is not ruined by white light. Check the TVS website for the latest information.

Header Image: STS-114 external fuel tank, post-separation from Shuttle Discovery on July 26, 2005. This was the first shuttle mission after the loss of Shuttle Columbia in 2003. Typically, the external fuel tank reenteresthe Earth's Atmosphere, landing in the Indian Ocean. For more details on the STS-114 mission, see: http://en.wikipedia.org/wiki/STS-114

Calendar of Events

June 16, 12:00pm

What: Ultra-lightweight Probes to Catalyze Interstellar Exploration
Who: Jon Rather, RCIG
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

Based on present space science and engineering, interstellar travel remains highly unlikely. Applying synergistic emerging technologies to enhance capabilities for accelerated space development in the solar system may catalyze possible steps to the stars. A stepwise sequence of plausible projects will be proposed. The remarkable present progress in diverse applied sciences can be a game changer.

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

June 19, July 24: 8:30-10:30pm

What: Summer in Space Movie Series
Who: You at the Outdoor Amphitheater
Where: Chabot Space and Science Center, 10000 Skyline Blvd., Oakland, CA 94619
Cost: $10 (does not include general admission)

Grab some popcorn and join us in our outdoor amphitheater as we celebrate classic science fiction films from the 1950's and 1960's. Inspired by comic books, these family-friendly films sparked the world's interest in interstellar travel, aliens and otherworldly terrains.

June 19: "Radar Men From the Moon"

July 24: "Flash Gordon Conquers the Universe"

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

June 20, 8:30pm

What: The Top Tourist Sights of the Solar System: Where Bill Gates' Great-Granddaughter Will Go on Her Honeymoon
Who: Andrew Fraknoi, Foothill College, Astronomy Dept. Chair
Where: Mt. Tamalpais State Park, Cushing Memorial Amphitheater, more commonly known as the Mountain Theater, Rock Spring parking area
Cost: Free

Using spectacular images from space probes and the world's largest telescopes, explore the most intriguing future "tourist destinations" among the planets and moons in our cosmic neighborhood. Among our stops will be the 4,000-mile lava channel on Venus, the towering Mount Olympus volcano on Mars, the awesome Verona Cliffs on the moon Miranda (the tallest "lover's leap" in the solar system), and the recently discovered steam geysers on Saturn's intriguing moon Enceladus.

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

June 23, 12:00pm

What: A Holographic Quantum Theory of Spacetime
Who: Tom Banks, UC Santa Cruz
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

The theory called Holographic Space-time is an attempt to generalize String Theory so that one can discuss local regions of space-time. Its key feature is a mapping between quantum concepts and the geometry of space-time. Causality conditions are imposed, as in quantum field theory, by insisting that things which cannot have mutual quantum interference are things that are causally separated. Geometrical sizes are encoded via the Holographic Principle: the number of quantum states in a region is determined by the area of a certain surface surrounding that region. In 1995, Jacobson showed

continued on page 4

that one could derive Einstein's equations by imposing this principle in every space-time region. Einstein's equations are the hydrodynamic equations of a system whose statistics obey the Holographic connection between space-time and the number of quantum states. Dr. Banks will outline the application of these ideas to a new model of the early inflationary universe, as well as to a rough prediction of the masses of supersymmetric particles.

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

June 30, 12:00pm

What: Asteroid Day Special Event
Who: Michael Busch and Peter Jenniskens, SETI Institute
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

To celebrate 'Asteroid Day', the SETI Institute is holding a special event where two SETI asteroid scientists will give short presentations on the latest thinking on how to handle the Near-Earth Asteroid (NEA) problem and the goals of NASA's Asteroid Return Mission (ARM). Michael Busch will give a talk on the properties of target NEAs and Peter Jenniskens will give a talk on a new concept (SHEPHERD) for the Asteroid Return mission.

Characterizing Target Asteroids for ARM with Michael Busch

ARM would go to a near-Earth asteroid, pick up a large block or boulder, and return it to Earth-Moon space. Based on ground-based and spacecraft observations, the ARM team has identified four candidate asteroids: 2008 EV5, Bennu, Itokawa, and 1999 JU3. I'll review what we currently know about these objects and how we've learned it.

The SHEPHERD Asteroid Return Mission with Peter Jenniskens

The current ARM is focussed on collecting a boulder from a large asteroid, in part because small free-floating asteroids are hard to characterize in advance well enough to give engineers certainty that they can handle the rock. Future asteroid utilization missions will face the same issue. Now, Peter Jenniskens, working with Bruce Damer, Stuart Pilorz, Julian Nott, and other colleagues, has proposed a way to get around that difficulty, and in the process they created a new vision for future space exploration.

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

July 3, 7:00pm

What: Lost in Space Adult Missions
Who: Challenger Learning Center
Where: Chabot Space and Science Center, 10000 Skyline Blvd., Oakland, CA 94619
Cost: $30, does not include general admission; RSVP recommended, space limited, register online or call (510) 336-7373

Just like our public missions for families, but this one is strictly for adult flyers. Bring your friends and join an intrepid team to land on the red planet, construct a probe to send to one of the moons of Mars and save your crew from calamity. Grab your flight suit, strap on a helmet and experience the thrill and excitement of a NASA simulated space mission to Mars! Beer (provided by Federation Brewery), wine and light snacks will be provided.

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

July 6, 7:30pm

What: The Birth of Suns
Who: Prof. Mark Krumholz, Astronomy & Astrophysics Dept., UCSC
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.

We've all learned that space is an empty vacuum, but it's not. The space between the stars in our Galaxy contains, on average, about 1 atom per cubic centimeter. That's a better vacuum than the best vacuum chamber we know how to make, but there are a lot of cubic centimeters in interstellar space, so the mass of all the gas between the stars adds up to about 10% of the mass of all the stars put together. The temperature of this gas varies enormously from place to place in the Galaxy, with temperatures as high as millions of degrees and as low as a few degrees above absolute zero. In the coldest regions of interstellar space, over millions of years gravity is able to draw the atoms together into immense clouds that ultimately condense into clusters of new stars. In our Galaxy, this process produces stars at a rate of about 1 new Sun per year, the stars it makes are typically the size of the Sun or a little smaller.

While we understand how this happens in general outline, many fundamental questions remain unanswered. What sets the rate at which stars form? What determines the final sizes of the individual stars? Where did our Sun form, and what happened to its siblings, the stars that formed out of the same cloud? In this talk I will describe what we currently know, and what we don't, about the birth of new Suns.

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

Journal Club By Ken Sperber

Pluto: New Horizons Flyby July 14, 2015

In about one month's time, 85 years of mystery about Pluto and its recently discovered moons will finally come to an end with the flyby of the Pluto system by the New Horizons spacecraft. New Horizons has been on a 4.8 billion km journey to Pluto since it was launched on January 19, 2006 on an Atlas V. Given that New Horizon's launch velocity was the largest of any space probe, it passed the orbit of the Moon in only 9 hours, and within 3 months it passed the orbit of Mars. By March 2007 it had passed Jupiter, where a gravity assist put it on course for Pluto. Soon thereafter the spacecraft was put into hibernation until it was awakened in December 2014 (what a snooze!).

According to NASA's New Horizons website, the science payload includes seven instruments:

Ralph: Visible and infrared imager/spectrometer; provides color, composition and thermal maps.

Alice: Ultraviolet imaging spectrometer; analyzes composition and structure of Pluto's atmosphere and looks for atmospheres around Charon and Kuiper Belt Objects (KBOs).

REX: (Radio Science EXperiment) Measures atmospheric composition and temperature; passive radiometer.

LORRI: (Long Range Reconnaissance Imager) telescopic camera; obtains encounter data at long distances, maps Pluto's farside and provides high resolution geologic data.

SWAP: (Solar Wind Around Pluto) Solar wind and plasma spectrometer; measures atmospheric "escape rate" and observes Pluto's interaction with solar wind.

PEPSSI: (Pluto Energetic Particle Spectrometer Science Investigation) Energetic particle spectrometer; measures the composition and density of plasma (ions) escaping from Pluto's atmosphere.

SDC: (Student Dust Counter) Built and operated by students; measures the space dust peppering New Horizons during its voyage across the solar system.

By early 2015, New Horizon's images exceeded the resolution of those from the Hubble Space Telescope. Due to the potential danger that additional (undiscovered) moons or a ring system could pose to the spacecraft, the LORRI imager took sensitive images (below-left). Fortunately, no hazards were revealed. If hazards are found in the late May "hazard-search" images, "the New Horizons team has until July 4 to divert the spacecraft to one of three alternate routes."

Meanwhile, scientists are busy publishing their predictions of different aspects of the Pluto system in anticipation of observations from New Horizons. Pluto and its moon Charon are unique in that their barycenter, the point about which they orbit, is located external to Pluto. Modelling by Showalter et al. (2015) indicates that Nix and Hydra, which are elongated, wobble incessantly in the changing gravitational field of Pluto and Charon (below-right Artist's concept). See the movie of Nix's chaotic rotation at: https://www.youtube.com/watch?v=zwSFC-aPEG0.

Android and iPhone apps are available to follow the New Horizons mission: http://thenextdigit.com/22107/install-free-pluto-safari-app-follow-nasas-new-horizons-mission-pluto/ For more information on the New Horizons mission see: http://www.nasa.gov/mission_pages/newhorizons/main/index.html

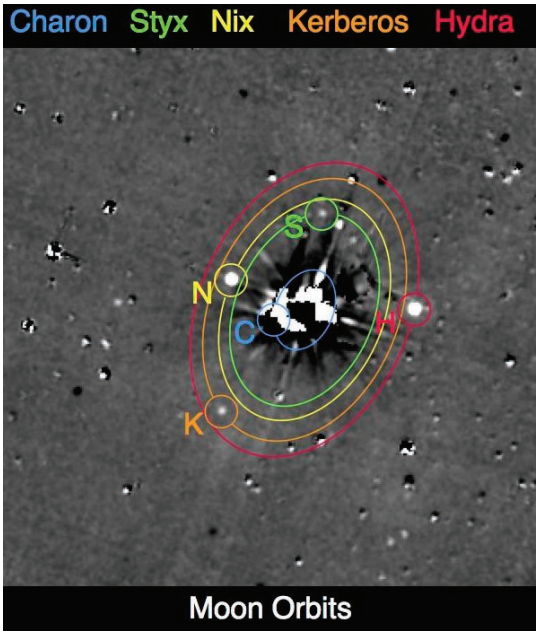


Image Caption: Left: This heavily processed image of the Pluto system was taken on May 11-2, 2015 (see: http://www.nasa.gov/feature/so-far-all-clear-new-horizons-team-completes-first-search-for-pluto-system-hazards). Right: Artist's concept of the chaotically changing orientation of Pluto's Moon Nix: Credit NASA, ESA, M. Showalter (SETI Institute), and G. Bacon (STScI).

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

All times are Pacific Daylight Time.

June

13	Sat	Jupiter and Venus 10 degrees apart, with M44 below Venus in the west (dusk)
16	Tue	New Moon (7:05am)
19	Fri	Venus and Jupiter below the crescent Moon (evening)
21	Sun	Crescent Moon 5 degrees left of Regulus, with Jupiter and Venus to the lower right (evening)
24	Wed	First-Quarter Moon (4:02am)
25	Thu	Regulus about 5 degrees above the First-Quarter Moon
27-	Sat-	Venus and Jupiter less than 2 degrees apart, and closing, during the next week
28	Sun	Saturn is about 2 degrees from the Moon
30	Tue	Venus and Jupiter in conjunction, less than 1/3 degree apart

July

1	Wed	Full Moon (7:20pm)
1	Wed	Venus and Jupiter very close, but moving apart during the month (evening)
8	Wed	Last-Quarter Moon (1:24pm)
12	Sun	Waning crescent Moon within 5 degrees of Aldebaran
14	Tue	Venus makes closest approach to Regulus (2-3 degrees)
15	Wed	New Moon (6:24pm)
18	Sat	Venus within a few degrees of the crescent Moon and Regulus with Jupiter to the right (evening)
23	Thu	First-Quarter Moon (9:04pm)
25	Sat	Ceres at opposition (see July S&T, p. 50)
25	Sat	The Moon is a few degrees from Saturn
30	Thu	Delta Aquariid meteor shower (nearly Full Moon compromises the view)
31	Fri	Full Moon (3:43am)

The "G" in GOES Is What Makes It Go

By Dr. Ethan Siegel

Going up into space is the best way to view the universe, eliminating all the distortion effects of weather, clouds, temperature variations and the atmosphere's airflow all in one swoop. It's also the best way, so long as you're up at high enough altitudes, to view an entire 50 percent of Earth all at once. And if you place your observatory at just the right location, you can observe the same hemisphere of Earth continuously, tracking the changes and behavior of our atmosphere for many years.

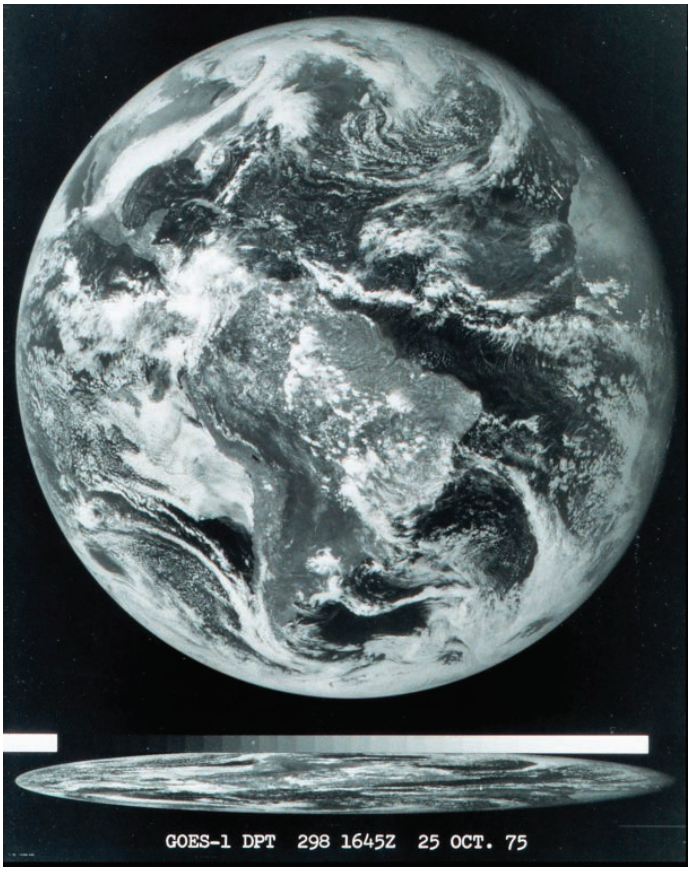


Image credit: National Oceanic and Atmospheric Administration, of the first image ever obtained from a GOES satellite. This image was taken from over 22,000 miles (35,000 km) above the Earth's surface on October 25, 1975.

The trick, believe it or not, was worked out by Kepler some 400 years ago! The same scientist who discovered that planets orbit the sun in ellipses also figured out the relationship between how distant an object needs to be from a much more massive one in order to have a certain orbital period. All you need to know is the period and distance of one satellite for any given body, and you can figure out the necessary distance to have any desired period. Luckily for us, planet Earth has a natural satellite—the moon—and just from that information, we can figure out how distant an artificial satellite would need to be to have an orbital period that exactly matches the length of a day and the rotational speed of Earth. For our world, that means an orbital distance of 42,164 km (26,199 miles) from Earth's center, or 35,786 km (22,236 miles) above mean sea level.

We call that orbit geosynchronous or geostationary, meaning that a satellite at that distance always remains above the exact same location on our world. Other effects—like solar wind, radiation pressure and the moon—require onboard thrusters to maintain the satellite's precisely desired position above any given point on Earth's surface. While geostationary satellites have been in use since 1963, it was only in 1974 that the Synchronous Meteorological Satellite (SMS) program began to monitor Earth's weather with them, growing into the Geostationary Operational Environmental Satellite (GOES) program the next year. For 40 years now, GOES satellites have monitored the Earth's weather continuously, with a total of 16 satellites having been launched as part of the program. To the delight of NASA (and Ghostbusters) fans everywhere, GOES-R series will launch in 2016, with thrice the spectral information, four times the spatial resolution and five times the coverage speed of its predecessors, with many other improved capabilities. Yet it's the simplicity of gravity and the geostationary "G" in GOES that gives us the power to observe our hemisphere all at once, continuously, and for as long as we like!

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 ($70). 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.