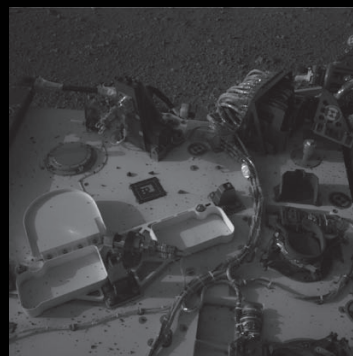


PRIMEFOCUS

Tri-Valley Stargazers



August 2012



Meeting Info

What:

Part 1: Member Show & Tell

Part 2: Lecture: Building the World's Largest Telescopes: The Future of Ground-Based Astronomy

Who:

Dr. Thomas L. Zobrist

When:

August 17, 2012

Doors open at 7:00 p.m.

Member Photos at 7:30 pm

Featured Speaker at 8:00 pm

Where:

Unitarian Universalist
Church in Livermore
1893 N. Vasco Road

Inside

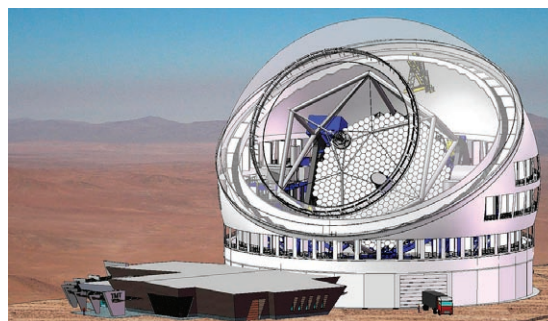
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August Meeting

Building the World's Largest Telescopes: The Future of Ground-Based Astronomy

Thomas L. Zobrist, Ph.D.

Tom Zobrist will recap his experience working at the Steward Observatory Mirror Laboratory (SOML) helping to build the world's largest astronomical telescopes, including LBT, GMT, and LSST. He will provide a brief explanation of the fabrication process, starting from 5 kg chunks of glass to producing light-weighted, monolithic telescope mirrors up to 8.4 m diameter. Results from the Large



Caption: Artist's conception of the Thirty Meter Telescope (TMT). Image Credit: <http://www.tmt.org/>

Binocular Telescope (LBT), currently the world's largest telescope, will be highlighted to show the comparison between ground-based and space-based astronomy. SOML is currently fabricating the mirrors for the Large Synoptic Survey Telescope (LSST) and the Giant Magellan Telescope (GMT), which will each revolutionize ground-based astronomy when they are complete. Tom will discuss how LSST will allow every amateur astronomer to have access to an 8.4 m research-grade telescope, and about the race between GMT and its competitors, the Universities of California led Thirty Meter Telescope and the European Extremely Large Telescope, for the title of World's Largest Telescope.

Tom Zobrist grew up in Seattle, under a protective layer of grey cloud. In 2003, he foolishly accepted a graduate appointment at the University of Arizona to study at the Optical Sciences Center, where he was subjected to the most traumatic experience of his life, exposure to direct sunlight. As a reaction to the experience, Tom accepted a job working at the University of Arizona OSC Optics Fabrication Facility, located four stories underground where direct sunlight (rarely) reached. He spent his days aligning complex null systems for measuring the surface figure of the precision optics they were fabricating, and waiting for the sun to set so that he could go outside without being vaporized. On his walks home at night, Tom discovered that the skies of Arizona also had LOTS of stars. After a stint at the Steward Observatory Mirror Laboratory, the sweltering Arizona heat, incessant blue skies and persistent sunlight finally convinced Tom to move to LLNL, where he works at the National Ignition Facility. He likes the Tri-Valley very much, although he does find the sky to be a bit bluer than he cares for most days, but maybe he is just picky.

Show and Tell: Venus Transit

Prior to Dr. Zobrist's presentation, club members are encouraged to share their adventures, observations, and photos of the Venus Transit. Please RSVP Gert Gottschalk (drgert1@yahoo.com) if you are available to participate.

News & Notes

2012 TVS Meeting Dates

The following lists the TVS meeting dates for 2012. 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
Aug. 17	Aug. 20	
Sep. 21	Sep. 24	Aug. 31
Oct. 19	Oct. 22	Sep. 28
Nov. 16	Nov. 19	Oct. 26
Dec. 21	Dec. 24	Nov. 30

Money Matters

Treasurer David Feindel indicates that as of July 8, 2012 the TVS checking account balance is \$12,302.78

H2O Open House on August 11

On August 11 TVS will hold an Open House to visit the club observing site, H2O. Our Open Houses are meant to give members a guided tour of the site, and an opportunity to observe under dark skies. You will have the opportunity to observe through the club's 17.5-inch equatorially mounted Newtonian telescope, housed in a permanent roll-off roof observatory.

Non-key holding members and the general public must be escorted to, while at, and from the site by key holding members -- NO EXCEPTIONS. For those members who have yet to check out the site, it is about an hour's drive south of Livermore, along a very windy road. It is a primitive site—no water or electricity, with a couple of outhouses. What it lacks in amenities, it makes up for in dark skies.

Those interested should meet at the corner of Mines Road and Tesla Road at 6:30pm. There is a \$3 per car fee at H2O, which is part of our rental agreement for the hilltop.

Star Party Requests/Participation

August 14, Oregon Star Party: If you want more information, contact Todd Billeci, TVS Vice-President and Program Director. Todd says that he would be happy to organize a caravan.

Please contact me, Ken Sperber, directly, or through the TVS Yahoo Users Group, with announcements of club-relevant time-sensitive events that you would like published in the newsletter.

Journal Club by Ken Sperber

Building Blocks of the Milky Way's Supermassive Black Hole

Hierarchical formation, the growth of large objects from smaller constituents, appears to be a general characteristic of our universe. Planets are eventually formed from collisions of small rocky bodies (as well as the accretion of gas) that previously formed out of dust particles. Present-day galaxies formed from mergers of smaller galaxies, and their central supermassive black holes are believed to be built up from intermediate mass black holes, which in turn may be built up of solar mass black holes.

In February 2012 I wrote a *Journal Club* column that described flares of the Milky Way Supermassive Black Hole (SMBH), Sag A*. The size of the flares suggested that Sag A* is feeding on asteroid sized bodies. This month's column describes research by Oka et al. (2012, *The Astrophysical Journal Supplement Series*, 201: 14, doi:10.1088/0067-0049/201/2/14) that surveys the central part of our galaxy close to Sag A*. The results of this study support the hierarchical growth scenario of SMBH's.

The authors obtained more than 250 hours of observations with the Atacama Submillimeter Telescope Experiment 10-meter telescope from 2005 to 2010. They studied a region about 2 degrees around Sag A*, making observations at a wavelength of 0.87mm. Over this ~2 degree region, ~30,000 spectra were taken with a spatial resolution of about 34" of arc. The 0.87mm wavelength is sensitive to the J=3-2 transition of Carbon Monoxide. These observations were compared to the J=1-0 transition of Carbon Monoxide that were previously obtained with the Nobeyama Radio Observatory 45m survey. From having measurements of these two transitions, the authors were able to determine the temperature and density of gas near the galactic center. They discovered the presence of 3 new molecular clouds that have temperature of about 40K (40 degrees Kelvin above absolute zero) with about 10,000 hydrogen molecules per cubic centimeter.

Detailed analysis of the spectra indicated that the three newly discovered molecular clouds are expanding. Within the region denoted $l=+1.3^\circ$, high-resolution J=1-0 maps indicated 9 expanding shells of gas. Based on the size of the region, and the expansion velocity of the shells, the age of this molecular cloud was estimated at 60,000 years. Given the estimated kinetic energy (remember $E_k=0.5mv^2$) of 2×10^{52} erg, and the shell structure, it is believed that the expansion is powered by the equivalent of 200 supernova explosions. Given the expansion rates and bubble-like structure of the $l=-0.4^\circ$ and the $l=-1.2^\circ$ regions, it is believed that

Header Image: Surface of the MSL Curiosity, as seen by the Left Navigation Camera on Sol 2. Note the dust and small rocks on the rover that were kicked up by the exhaust from the Sky Crane engines. Image Credit: NASA/JPL-Caltech

Journal Club (continued)

these molecular clouds are also expanding due to supernova explosions and/or outflows from Wolf-Rayet stars.

Sag A* lies in the fourth molecular cloud, Sag A, that Oka et al. (2012) observed. Expansion was not apparent in this cloud. Rather, Dr. Oka says the data suggest "that the gas clump 'Sgr A' has a disk-shaped structure with radius of 25 light-years and revolves around the supermassive black hole at a very fast speed."

The fate of the newly discovered molecular clouds is uncertain. However, according to theory, in huge star clusters where the density of stars is so high, the stars can merge and form intermediate mass black holes (IMBHs) that are hundreds of times the mass of our Sun. Dr. Oka says that in the $l = -0.4^\circ$ region "Our observation data has already indicated traces of IMBHs," but evidence of rotation is needed to confirm their presence. If the presence of the IMBHs is confirmed, this could be the "smoking gun" for hierarchical growth of SMBHs, since these star clusters/molecular clouds may merge with Sag A*, the SMBH at the center of the Milky Way.

For more information see: <http://www.sciencedaily.com/releases/2012/07/120720083011.htm>, and the journal article Oka et al. (2012) is available via doi: 10.1088/0067-0049/201/2/14

Calendar of Events

August 17, 1:00pm

What: Searching for life on Mars using 3D hyperspectral and fluorescent data

Who: Jan-Peter Muller, University College, London

Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA

Cost: Free

Abstract pending.

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

August 18, 8:30pm

What: The Reality Interface

Who: Ransom W. Stephens, Ph.D.

Where: Mt. Tamalpais State Park, Cushing Memorial Amphitheater, more commonly known as the Mountain Theater, Rock Spring parking area

Cost: Free

Every emotion, memory, concept--however abstract or concrete, everything you know is derived from your five senses. Learn how the brain processes sensory data and affects your perceptions of reality.

For more information see: <http://www.mttam.net/astronomy/schedule.html>

August 21, 23, 11:00am and 1:00pm

What: Comet and Meteor Making

Who: You

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

Cost: Guests: \$5 + General Admission, register online or call (510) 336-7373

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650-593-2665

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unfilled

Mentor:

Mike Rushford
rushford@eyes-on-the-skies.org

Refreshment Coordinator:

Laurie Grefsheim

Web & E-mail

www.trivalleystargazers.org
tvs@trivalleystargazers.org

Eyes on the Skies

Eyes on the Skies is a robotic solar telescope run by Mike Rushford (rushford@eyes-on-the-skies.org). You may access it by visiting www.eyes-on-the-skies.org.

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 (trivalleystargazers@gmail.com) 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)

Create your own comet! Using all the ingredients that make up the real celestial icy bodies, explore the workings of a comet including what they are made of and why there are meteor showers. Talk about Halley's Comet and its periodic return to Earth. Guided by our experienced instructors, this class will challenge and excite space explorers of all ages. Ages 6+

For more information see: <http://www.chabot.space.org/events.htm>

August 22, Noon-1:00pm

What: Radio Anatomy of Saturn's Rings with Cassini
Who: Essam Marouf, San Jose State University
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

Abstract pending.

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

August 24, 6:00pm

What: Moonlight Hike
Who: Hiking Guide
Where: Chabot Space & Science Center, 10000 Skyline Blvd., Oakland, CA 94619
Cost: \$7, RSVP recommended, register online or call (510) 336-7373

Hike through the redwoods in twilight and moonlight on a moderately strenuous 4-5 mi hike. Trail walks are led by an experienced hiker and Chabot educator and feature discussions about the natural environment and events and objects in the sky. Hike will take place rain or shine.

For more information see: <http://www.chabot.space.org/events.htm>

August 24, 6:00-10:00pm

What: Star Party Preview
Who: Hiking Guide
Where: Chabot Space & Science Center, 10000 Skyline Blvd., Oakland, CA 94619
Cost: Included with General Admission

Join the editors of Astronomy magazine, Chabot staff and the East Bay Astronomical Society for our Friday night Telescope Maker's Workshop and conversations on astro-imaging, telescope viewing tips and the basics of astronomy.

For more information see: <http://www.chabot.space.org/events.htm>

August 25, 10:00am-10:00pm

What: Star Party
Who: Hiking Guide
Where: Chabot Space & Science Center, 10000 Skyline Blvd., Oakland, CA 94619
Cost: Included with General Admission

Why should the night sky have all the fun?! The stars won't be out until later this evening, but our star party will start rockin' in the daylight hours and continue through nightfall. Join us for a day of astronomy along with our friends at Astronomy magazine and Celestron Telescope Company. Dabble in hands-on make stations, enjoy solar viewing on our Observatory Deck (weather permitting), crafts and creations throughout the Center, and cafe-style conversations with experts in the field. Let your inner star shine at our party in the hills!

For more information see: <http://www.chabot.space.org/events.htm>

August 29, 7:00pm

What: "Rare Earth" twelve years later: What We Know Now
Who: Peter Ward, Department of Biology, The University of Washington
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

Abstract pending.

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

September 5, Noon-1:00pm

What: Coronal heating and acceleration and NASA's Solar Probe Plus mission
Who: Stuart Bale, UC Berkeley
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

Abstract pending.

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

September 10, 7:30pm

What: The Supernova of a Generation: SN 2011fe
Who: Dr. Joshua Bloom, UC Berkeley
Where: California Academy of Science, 55 Music Concourse Dr., Golden Gate Park, San Francisco, CA
Cost: Adults \$12, Seniors \$10, Academy members \$6. Reserve a Space Online or call 415-379-8000

When some stars die they produce remarkably bright "supernova" fireworks. Supernovae, the main source of the iron

Calendar of Events (continued)

in our bodies, have had a profound impact on science for centuries. More recently, some types of explosions—called “Ia” supernovae—were used to make precise measurements of distance that revealed the mysterious acceleration of the universe. Despite their importance, however, scientists still do not know what sort of star (or stars) lead to such supernovae nor do they understand in detail the mechanisms responsible for such explosions. Well-studied nearby supernovae, which could shed light on these deep mysteries, are uncommon. This past year, a rare Type Ia supernova dubbed SN2011fe was discovered in the Pinwheel Galaxy. Dr. Bloom, one of the researchers who facilitated the discovery and subsequent observations, will discuss some of the breakthrough results from SN 2011fe in the context of supernova science as well as some of the broader implications of the discovery.

See <http://www.calacademy.org/events/lectures/> for lecture and reservation information.

September 12, Noon-1:00pm

What: Ice on the Move: From Io to Pluto
Who: John Spencer, Southwest Research Institute
Where: SETI Headquarters, 189 N. Bernardo Ave.,
Mountain View, CA
Cost: Free

It's perhaps no surprise that the cold worlds of the outer solar system often display surfaces covered in ice, though the ice composition is sometimes unexpected, including sulfur dioxide or nitrogen ice, for instance, in addition to water ice. The motion of these ices as they sublime and condense can have profound effects on these worlds and their atmospheres. The variable patchy atmosphere of Io, the extreme albedo contrasts seen on small scales on Callisto and on large scales on Iapetus, and seasonal changes in the atmospheres of Pluto and Triton, are all controlled by the movement of surface ices.

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

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

All times Pacific Daylight Time.

August

- 11-12 Sat- Perseid Meteor Shower peaks after midnight
- 13-14 Mon- Mars passes between Saturn and Spica low in the west-southwest
- 14-27 Tue Mercury more than 10 degrees above the eastern horizon (half-hour before sunrise)
- 17 Fri **New Moon (8:54am)**
- 21 Tue The crescent Moon, Mars, Saturn, and Spica make a quadrilateral low in the western sky (late twilight)
- 24 Fri **First Quarter Moon (6:54am)**
- 31 Fri **Full Moon (6:58am); Neptune 6 degrees south of the Moon**
- 31 Fri Regulus about 2 degrees to the lower-right of Mercury (20 minutes before sunrise)

September

- 1 Sat Venus 9 degrees south of Pollux
- 8 Sat **Last Quarter Moon (6:15am); Jupiter ~1 degree north of Moon (see Sept. S&T, p. 48)**
- 9 Sun Ceres 0.6 degrees south of Moon
- 12 Wed Venus 4 degrees north of Moon
- 13 Thur Algol at minimum for 2 hours centered on 10:02pm
- 14 Fri Thin crescent Moon to lower-right of Regulus (1 hour before dawn)
- 14-28 Fri- Zodiacal light visible in the east 1-2 hours before sunrise
- 15 Sat **New Moon (7:11pm)**
- 18 Tue Moon well to Saturn's left (evening)
- 19 Wed Moon just left of Mars (evening)
- 22 Sat Autumn begins (7:49am)
- 22 Sat **First Quarter Moon (12:41pm)**

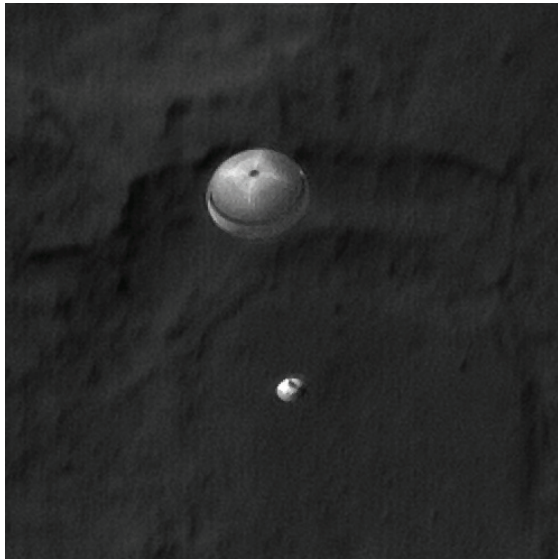
Mission Update by Ken Sperber

Curiosity: Along for the Ride

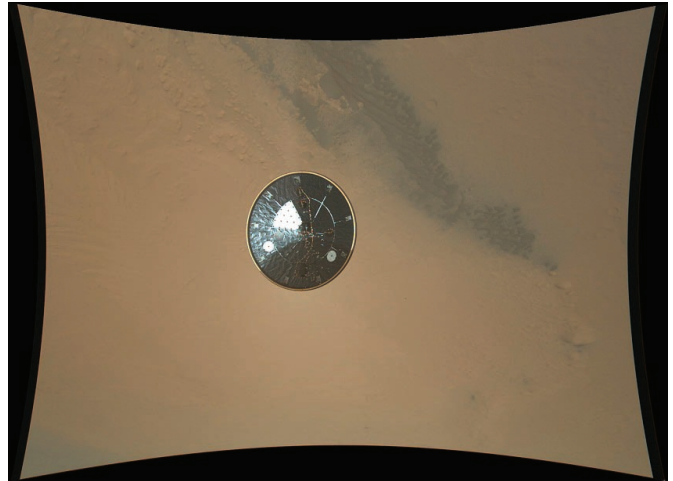
Wow! What can you say but WOW!!!

I felt like a little kid again as I stayed up late to watch the coverage of another awe-inspiring NASA mission. Watching the coverage of the landing of Curiosity, the Mars Science Laboratory (MSL), brought me back to the days of being glued to the TV to watch a Gemini launch, see Neil Armstrong walk on the Moon, watch the first launch of the Space Shuttle, ...

The descent of MSL was captured by the HiRISE camera on board the Mars Reconnaissance Orbiter:



Meanwhile Curiosity was chronicling her passage through the Martian atmosphere with her descent imager. Below is an image of the heat shield about 2 seconds after it was released by MSL. The heat shield measures about 4.5 meters in diameter, and was estimated to be about 15 meters away from MSL.



I'm greatly anticipating the download of the full suite of high-resolution images from the descent camera. When assembled into a movie, I expect that I'll feel like I was along for the ride with Curiosity as she made her amazing landing at Gale Crater, a panorama of which is seen below. The rim of Gale Crater is seen in the distance (~20km).

To me, the landing site looks like Death Valley.

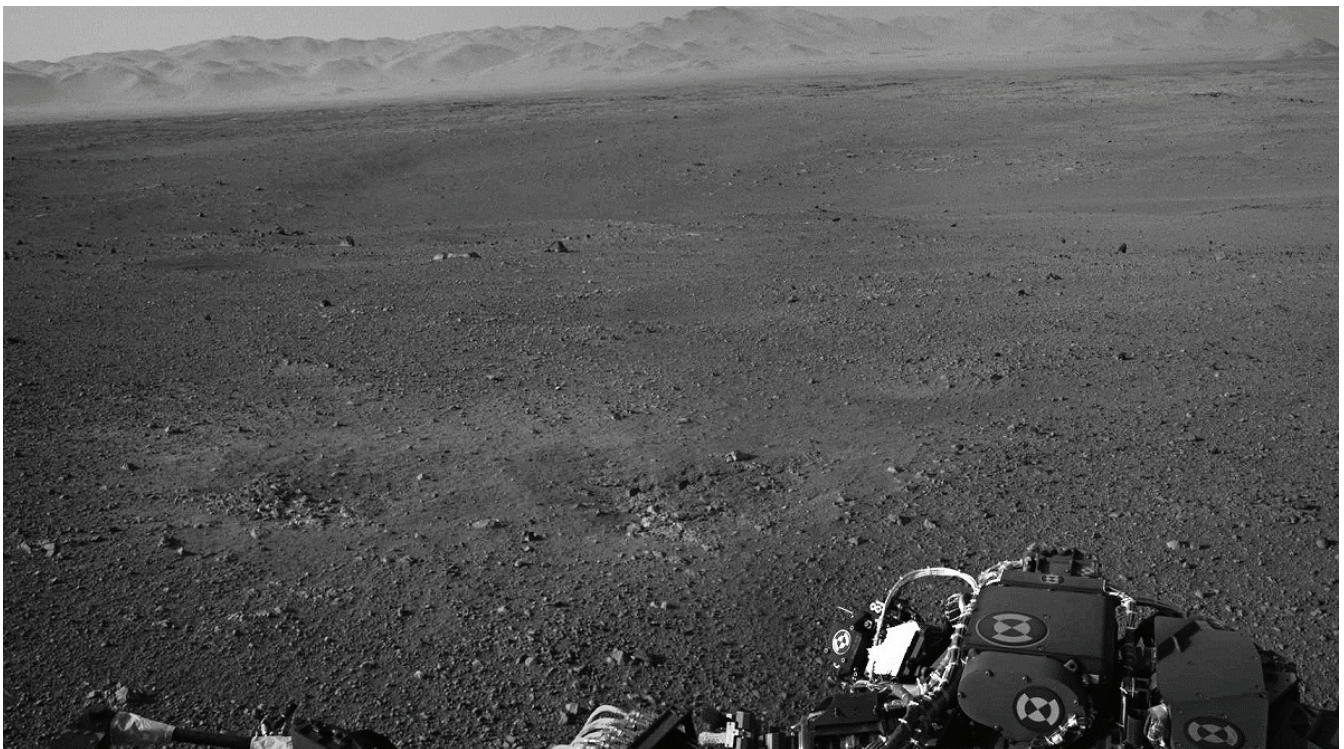


Image Captions: Upper-left: MSL descending on its parachute (Credit: NASA/JPL/University of Arizona); Upper-right: MSL heat shield (Credit: NASA/JPL-Caltech); Bottom: Image of Gale Crater from the Navigation Camera. Notice the two trenches carved out by the exhaust from the Sky Crane engines. (Credit: NASA/JPL-Caltech).

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



PRIMEFOCUS

Tri-Valley Stargazers Membership Application

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.

Name _____ Phone _____ e-mail _____

Address _____

Do not release my: _____ address, _____ phone, or _____ e-mail information to other TVS members.

- Membership category:
- _____ \$5 Student.
 - _____ \$30 Basic. You will receive e-mail notification when the PDF version of Prime Focus is available for download off the TVS web site.
 - _____ \$10 Hidden Hill Observatory (H2O) yearly access fee. You need to be a key holder to access the site.
 - _____ \$20 H2O key holder fee. (A refundable key deposit—key property of TVS).
 - _____ \$40 Patron Membership. Must be a member for at least a year and a key holder.
 - _____ \$34 One year subscription to Astronomy magazine.
 - _____ \$60 Two year subscription to Astronomy magazine.
 - _____ \$32.95 One year subscription to Sky & Telescope magazine. Note: Subscription to S&T is for new subscribers only. Existing subscribers please renew directly through S&T.
 - \$ _____ Tax deductible contribution to Tri-Valley Stargazers.
 - \$ _____ TOTAL – Return to: Tri-Valley Stargazers, P.O. Box 2476, Livermore, CA 94551

Membership information: Term is one calendar year, January through December. Student members must be less than 18 years old or still in high school.