

# PRIMEFOCUS

Tri-Valley Stargazers

August 2011



## Meeting Info

### What:

The New Moon

### Who:

Dr. Brian Day

### When:

August 19, 2011  
Doors open at 7:00 p.m.  
Lecture at 7:30 p.m.

### Where:

Unitarian Universalist  
Church in Livermore  
1893 N. Vasco Road

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## August Meeting

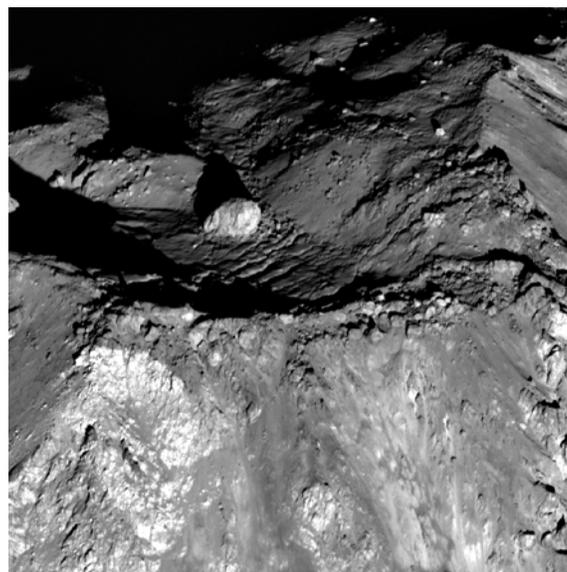
### The New Moon

#### Dr. Brian Day

Brian Day, from the NASA Lunar Science Institute and the Lunar Atmosphere and Dust Environment Explorer (LADEE) mission will present "The New Moon". This talk discusses how the new generation of robotic lunar explorers is fundamentally changing our understanding of the Moon. The talk looks back at results from Clementine, Lunar Prospector, Chandrayaan, and LCROSS, examines current findings from LRO, and looks ahead to the GRAIL, LADEE, and South Pole Aitken Basin missions.

LADEE is a mission in development for launch to the moon in 2013. The project recently passed the MCDR (Mission Critical Design Review) milestone which clears the project to move forward and will enter the SIR (Systems Integration Review) shortly. Systems testing will start in January 2012. We will get an early look at what the mission objectives are and other specifics on this project. As discussed at the website: [http://www.nasa.gov/mission\\_pages/LADEE/main/pm\\_update.html](http://www.nasa.gov/mission_pages/LADEE/main/pm_update.html) "LADEE will gather detailed information about conditions near the surface and environmental influences on lunar dust. A thorough understanding of these influences will help researchers predict how future lunar exploration may shape the moon's environment and how the environment may affect future explorers. It also will help scientists understand other planetary bodies with exospheres, or very thin atmospheres, like the moon."

Dr. Day has degrees in psychology, information systems, and astronomy. As an undergrad astronomy student he worked as a research assistant to Bruce Margon at the UCLA Observatory, studying BL Lacertae objects. During his graduate research in astronomy he investigated relationships between orbital periods and absolute magnitudes in cataclysmic binary systems. Before joining NASA in 2000, he worked as a software engineer in and around the Silicon Valley since 1982, taught programming courses at San Jose State, and served as chairman of the observatory at Foothill College for 16 years.



Caption: Oblique view of summit area of Tycho crater central peak taken by the Lunar Reconnaissance Orbiter (LRO). The boulder in the background is 120 meters wide, and the image is about 1200 meters wide. Image credit: NASA/GSFC/Arizona State University.

## News & Notes

### 2011 TVS Meeting Dates

The following lists the TVS meeting dates for 2011. 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. 19	Aug. 22	
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

Treasurer David Feindel indicates that as of July 18, 2011 the TVS account balances are:

Checking	\$5,420.09
CD #1	\$3,764.24 rolled over 5/17/2011
CD #2	\$2,657.00 rolled over 5/27/2011

### TVS Positions Available

We still need people to fill the positions of Vice-President and Secretary, and to serve on the Board of Directors. Please consider offering some of your time to influence the future direction of TVS. If you wish to help with any of these positions, please contact any officer or board member..

### TVS Yosemite Dates

TVS' annual public star party weekend at Glacier Point will take place on September 2-4, the Labor Day weekend. TVS puts on a star party both nights in exchange for free camping at the Bridalveil Campgrounds. The Moon is close to First-Quarter, setting between ~10:20pm and midnight during this weekend. The public star party ends at about midnight, and then the rest of night is yours to observe/image under the excellent dark skies of Yosemite National Park. Those interested in participating should contact Bob McKoon (rmckoon at yahoo.com).

## Journal Club by Ken Sperber

This month's journey takes us to Enceladus, the icy moon of Saturn that has "tiger-stripes" from which plumes of water vapor and ice particles have been observed by the Cassini spacecraft. The leading theory for these plumes is the emergence of jets from a liquid subsurface reservoir. Some of the plume particles have high enough velocities that they orbit Enceladus, where they form a torus (think of the torus as a donut shaped concentration of gas and particles that orbit Enceladus). Furthermore, as will be discussed later, the plumes are the source of the material that makes up the

E-Ring of Saturn.

Recently, the Cassini spacecraft flew within 21km (~13 miles) of Enceladus (the so-call E5 passage). During this encounter the spacecraft crossed the plume in the north-to-south direction while the Cosmic Dust Analyzer (CDA) instrument provided measurements of the masses of the plume particles. Postberg et al. (2011, Nature, doi:10.1038/nature10175) report on the concentrations of three types of plume particles: (a) Type I salt-poor grains, (b) Type II grains consisting of organics and/or silicates, and (c) Type III salt-rich grains. The relative concentrations of the grain types changed markedly during Cassini's passage through the plume. From just before closest approach the Type III salt-rich grains increased sharply in proportion to the other grain types, reaching >40% just after closest approach. Conversely, during this period there was a decrease in the proportion of Type I salt-poor grains. After closest approach, when Cassini entered the densest part of the plume, there was an increase in the Type II organic/silicate grains.

The change in proportions between the grain types can be understood by the differing mechanisms by which they form. The Type I salt-poor grains are believed to be formed by homogenous nucleation, resulting in relatively small particles, while the Type III salt-rich grains are larger, forming from salt-ice condensation cores from the frozen spray of salt water. The large grains do not travel as fast as the small grains, since the latter are more easily carried along by the escaping gas in the plume. This scenario was confirmed by the CDA high-rate detector that observed smaller velocities for more massive particles, consistent with the largest particles having their highest concentration close to the source of the plume. With their smaller velocities, the Type III salt-rich grains are less likely to escape the gravitational pull of Enceladus, while the smaller Type I salt-poor grains are more likely to escape the gravitational pull of Enceladus. This is consistent with the E-Ring composition, which is dominated by Type I salt-poor grains.

With their reducing atmospheres, it was surprising to find that Saturn and Titan are located within an oxygen-rich environment. In the early 2000's, numerical models suggested that a water vapor source near the orbit of Enceladus could be responsible for the oxygen-rich environment, an hypothesis supported by the 2006 discovery of the Enceladus plumes. To further investigate the role of water vapor to the oxygen-rich conditions around Saturn, Hartogh et al. (2011, Astron. & Astrophys., doi:10.1051/0004-6361/20117377) used submillimeter spectroscopy with the Herschel satellite to characterize water in disk-averaged observations of Saturn. The 2009

**Header Image:** Image of erupting plumes on Enceladus taken by the Cassini Orbiter on November 27, 2005. For more information see: <http://photojournal.jpl.nasa.gov/catalog/pia08386> Image credit: NASA/JPL/Space Science Institute.

## Journal Club (continued)

observations were taken when the Saturnian ring/satellite system was viewed nearly edge-on. These observations found an enhanced concentration of water vapor compared to observations taken in 1999, when the ring/satellite system was inclined by  $21^\circ$ . This indicated that the highest concentration of water vapor is confined to the near-equatorial region. Further analysis indicated that the observed enhancement of water vapor was not Saturnian in origin. The evidence for this conclusion is threefold: (1) from examining the characteristics of the spectral lines the brightness temperature of the water vapor was estimated to be 90K, a temperature not found in the upper atmosphere of Saturn, (2) even if such a cold layer did exist in the Saturnian atmosphere the vapor pressure of a Saturnian source of water would be too low to account for the observations, and (3) the line width is too narrow given the fast rotation of the planet, which would cause Doppler broadening of the spectral lines.

Evidence that the source of water vapor in Saturn's upper atmosphere is Enceladus was developed using a model to calculate the relative intensities of numerous water vapor spectral lines. The dominant source of radiation for exciting the spectral lines was determined to be thermal energy from a 100K brightness source, equivalent to what Saturn emits as seen from 4 Saturn radii distance, nearly equivalent to the 3.95 Saturnian radii distance that Enceladus lies from Saturn. The authors then modeled the Enceladus water vapor torus. Using the observed estimates of the Enceladus plume velocity (~1km/s) and concentration, and modeling how the plume disperses, the authors find that water vapor from Enceladus is sufficient to explain the amount of water vapor in the upper atmosphere of Saturn. This water vapor can also coat the Saturnian ring particles and the surfaces of other moons. However, the Enceladus water vapor is not suf-

ficient to explain the influx of water vapor that is believed to occur at Titan. The source of water vapor at Titan remains a mystery, and remains the subject of intensive investigation.

## Calendar of Events

June 21 - September 4, Tue-Fri: 12pm-3pm;  
Sat-Sun: 1pm-5pm

What: Solar Viewing  
Who: Chabot Space and Science Center  
Where: 10000 Skyline Boulevard, Oakland, CA 94619  
Cost: Free

At Chabot, when the Sun's up, the Sun comes out! With a spectrum of solar viewing aids, including Sun-watching scopes and filters as well as near-live satellite images and movies, explore the many faces of Earth's star. Sunspots, prominences, flares, and coronal mass ejections are all living solar events that you may witness personally. Chabot volunteers and staff will guide you through your personal solar experience, helping to give you a new appreciation of the power, the magnitude, and the sheer beauty of the Sun. Come and see... safely...

For more information see: <http://www.chabot.space.org/solar-viewing.htm>, or call (510) 336-7300.

August 17, Noon - 1pm

What: The WISE view of the Solar System  
Who: Joseph Masiero, Jet Propulsion Laboratory  
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountainview  
Cost: Free

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### **Officers**

#### **President:**

Chuck Grant  
cg@fx4m.com  
925-422-7278

#### **Vice-President:**

unfilled

#### **Treasurer:**

David Feindel  
feindel1@comcast.net

#### **Secretary:**

unfilled

### **Volunteer Positions**

#### **Librarian:**

Jim Alves  
ajaengr@yahoo.com  
209-833-9623

#### **Newsletter Editor:**

Ken Sperber  
sperbs13@yahoo.com  
925-361-7435

#### **Program Director:**

Jim Alves  
ajaengr@yahoo.com

#### **Loaner Scope Manager:**

John Swenson  
johnswenson1@comcast.net

#### **Webmaster:**

Hilary Jones  
hdjones@pacbell.net

#### **Observatory Director/ Key Master:**

Chuck Grant

### **Public Star Party Chair:**

Wayne Miller  
starpartytvs@gmail.com

#### **Historian:**

unfilled

#### **Mentor:**

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

#### **Refreshment Coordinator:**

Laurie Grefsheim

### **Web & E-mail**

[www.trivalleystargazers.org](http://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](http://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](mailto: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)

The Wide-field Infrared Survey Explorer (WISE) recently completed a thermal infrared survey of the entire sky, with sensitivity nearly two orders of magnitude better than its predecessor IRAS. Simultaneously, the NEOWISE augmentation allowed for the characterization and discovery of over 150,000 Solar system objects. Dr. Masiero will present an overview of both WISE and NEOWISE, and highlight some of the interesting recent results in Solar system science to come out of this data set, including new information on the classification of asteroids.

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

### August 24, 7:30pm

**What:** Kepler and Doppler Searches for ExoEarths and Optical SETI

**Who:** Geoff Marcy, Director of the Center for Integrative Planetary Science, UC Berkeley

**Where:** SETI Headquarters, 189 N. Bernardo Ave., Mountainview

**Cost:** Free

No details of this talk are available.

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

### August 31, Noon - 1pm

**What:** Do We Need String Theory to Quantize Gravity?

**Who:** Lance Dixon, High Energy Physics Laboratory, Stanford University

**Where:** SETI Headquarters, 189 N. Bernardo Ave., Mountainview

**Cost:** Free

The strong, weak, and electromagnetic interactions all have consistent, relativistic and quantum mechanical descriptions in terms of pointlike particles, but Einstein's theory of gravitation has long resisted a similar treatment, because of severe ultraviolet divergences. String theory solves these problems, but it introduces a new length scale, perhaps 16 orders of magnitude below what can be tested experimentally.

Dr. Dixon will describe recent theoretical progress in showing that a particular pointlike theory of gravity, called  $N=8$  supergravity, might also be quantum mechanically consistent. In particular,  $N=8$  supergravity has been shown explicitly to have no ultraviolet divergences in perturbation theory through the four-loop order. Dr. Dixon will also discuss the possible implications of these results.

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

### September 3, 8:00pm

**What:** Extreme Astronomy: Eyeing the Cosmos through a

Cubic Kilometer of Ice

**Who:** Dr. Kirill Filimonov, UC Berkeley

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

**Cost:** Free

Why physicists are fishing for elusive cosmic neutrinos using Ice Cube, the world's largest telescope located on the harshest continent on the planet.

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

### September 6, 6:00pm

**What:** Life: A Cosmic Story

**Who:** Ryan Wyatt (Director of Morrison Planetarium and Science Visualization) and Jeroen Lapre, Senior Technical Director, Morrison Planetarium - Visualization Studio)

**Where:** San Francisco Public Library, Koret Auditorium, 100 Larkin St.

**Cost:** Free: Reserve a Space Online or call 800-794-7576

Join us for a behind the scenes presentation on the making of Life: A Cosmic Story, the latest planetarium show from the California Academy of Sciences. Narrated by Jodie Foster, the planetarium show takes viewers on a high-speed ride through the history of life and plays 7-10 times daily through May 2012 at the Morrison Planetarium in Golden Gate Park. The show's core concept is that all life on Earth is related, having evolved from a common ancestor. Taking an even longer view, we see that life's origins begin with dark matter and the first stars—a pedigree 13.7 billion years in the making. The Academy drew on the expertise of several outside advisers as well as its own scientists to ensure that even the tiniest details were scientifically accurate and as up-to-date as possible. To produce the show's complex imagery, the Academy's Visualization Studio collaborated with Stanford University and the National Center for Supercomputing Applications. The collective experience of its staff in the visual effects industry totals more than 120 years, including work at Industrial Light & Magic, Pixar, and Lucasfilm Animation. Come learn how a show like this evolves from concept through production.

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

### September 7, Noon - 1pm

**What:** Gravity Probe B: The Relativity Gyroscope Experiment

**Who:** Barry Muhlfelder, High Energy Physics Laboratory, Stanford University

**Where:** SETI Headquarters, 189 N. Bernardo Ave., Mountainview

**Cost:** Free



**NGC6781, 12.5" F8 CDK, RGB 50:50:70min., ST10XME 1x1 -15C, July 2011, Gert Gottschalk**



**NGC6781, 12" F10 ACF & 0.66x Reducer, H-Alpha 9x5min., ST10XME 1x1 -15C, August 2009, Gert Gottschalk**

Caption: Images of Planetary Nebula NGC6781 taken by Gert Gottschalk. The upper image, taken through RGB filters, was obtained in July 2011 at H2O using his 12.5" CDK telescope, while the lower image was taken through a H-alpha filter and obtained in August 2009 using his 12" ACF telescope. The H-alpha filter brings out detail in the structure of the Planetary Nebula, while reducing the brightness of the starry background.

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

All times Pacific Daylight Time, unless otherwise noted.

### August

18-19 Thu- Mars is 1.5 degrees south of 3-mag Epsilon Geminorum (pre-dawn)

19 Fri Jupiter rises below the waning gibbous Moon (late evening)

21 Sun **Last-Quarter Moon (2:54pm)**

21 Sun The Pleiades rise above the Moon

22-23 Mon- Neptune at opposition

25 Thur Mars to the left of the crescent Moon (dawn)

28 Sun **New Moon (8:04pm)**

### September

3 Sat Binoculars and telescopes show 2.3-mag Delta Scorpii close to the Moon

4 Sun **First-Quarter Moon (10:39am)**

9 Fri Regulus less than 1 degree right of Mercury (30-45 minutes before sunrise)

12 Mon **Full Moon (2:27am)**

16 Fri Jupiter to the right of the Moon

16 Fri Ceres at opposition (see August S&T, p. 53. for finder chart)

20 Tue **Last-Quarter Moon (6:39am)**

## Calendar of Events (continued)

Gravity Probe B, launched 20 April 2004, is a space experiment testing two predictions of Einstein's theory of General Relativity, the geodetic and frame-dragging effects by means of cryogenic gyroscopes in Earth orbit. On-orbit data collection started August 2004 and ended September 2005. Analysis of the data from all four gyroscope results in a geodetic drift rate of  $-6,602 \pm 18$  mas/yr and a frame-dragging rate of  $-37 \pm 7$  mas/yr, to be compared with the GR predictions of  $-6,606$  mas/yr and  $-39$  mas/yr, respectively.

Dr. Muhlfelder has worked for 25 years, most recently as the project manager, on the Gravity Probe-B experiment. He will describe the final results of the latest experiment to test Einstein's gravitational theory.

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

### September 14, Noon - 1pm

What: Gravitational wave astronomy: a peek through the window

Who: Paul Groot, Radboud University, The Netherlands

Where: SETI Headquarters, 189 N. Bernardo Ave., Mountainview

Cost: Free

The direct detection of gravitational waves will offer a completely new window onto our Universe: one that is dominated by degenerate objects, black holes, explosions and mergers. Although this window is so far still obscured a glimpse of its richness can be seen from electromagnetic observations of gravitational wave sources. Dr. Groot will overview the progress in the fields of ultracompact binaries and the promise and results of synoptic surveys such as the Kepler observations and the Palomar Transient Surveys. As an aside, and to connect to the SETI mission, Dr. Groot will briefly discuss the possibility of life on planets around white dwarfs as well.

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



## New GOES-R to Give More Tornado Warning Time

By Dauna Coulter and Dr. Tony Phillips

So far this spring, more than 1,400 tornadoes have struck the U.S. Some of them have cut jaw-dropping trails of destruction across the countryside and, tragically, across inhabited communities, too. Hundreds of lives have been lost in the onslaught.

Throughout the season, the National Weather Service has routinely issued tornado alerts. In the case of the Alabama tornadoes of April 27th, forecasters warned of severe weather five full days before the twisters struck. Because they couldn't say precisely where the twisters would strike, however, many of their warnings went unheeded.

"If people get a hurricane warning, they often evacuate the area," notes NOAA's Steve Goodman. "But we react differently to tornado warnings."

Perhaps it's because tornadoes are smaller than hurricanes, and the odds of a direct hit seem so remote. Recent pictures from Tuscaloosa, Alabama, and Joplin, Missouri, however, show the perils of playing those odds. Goodman believes that more precise warnings could save lives.

To fine-tune tornado warnings, NOAA will soon launch the first in a series of next-generation weather satellites – GOES-R (Geostationary Operational Environmental Satellites-R series). The spacecraft is brimming with advanced sensors for measuring key ingredients of severe weather including winds, cloud growth, and lightning.

"GOES-R will be the first geostationary spacecraft to carry a lightning sensor," says Goodman, the GOES-R Program Senior Scientist. "Studies show that sudden changes in the total lightning activity correlate with storm intensity—and with tornadoes."

The lightning mapper will detect and map not only cloud-to-ground lightning, but also bolts within and between clouds. The kind of cloud-to-ground lightning we see from our front yards accounts for only 15-20 percent of total lightning. To get a clear idea of a storm's intensity, meteorologists need to know about all the lightning—a view GOES-R can provide.

All by itself, the lightning mapper will provide 7 minutes more lead time in tornado warnings, according to Goodman. GOES-R's state-of-the-art instruments will also improve long-range forecasts.

"The satellite's Advanced Baseline Imager (ABI), for instance, will provide a much clearer picture of clouds," says NOAA research meteorologist Tim Schmit. Compared to lesser instruments already in orbit, ABI can better detect super-cold "overshooting tops," evidence of enormous energy and upward velocity that correlate with subsequent severe

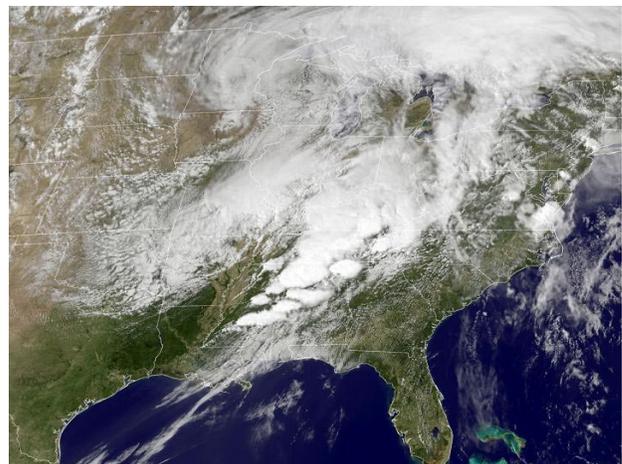
weather.

"Accurate advanced notice of high-risk tornadic conditions can cue officials to close schools and businesses even before tornadoes are actually detected," says Schmit.

Forecasters doubt tornadoes can ever be predicted with 100% accuracy. The twisters are just too capricious. GOES-R, however, is a step in the right direction.

Find out more about GOES-R's unprecedented capabilities at <http://www.goes-r.gov>. Young people can learn more about tornadoes and all kinds of other weather at <http://scijinks.gov>.

This article was provided courtesy of the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.



Caption: This GOES image shows the storms that spurred the intense April 27 tornado outbreak in the southern U.S. Animation showing the development of weather can be seen at <http://earthobservatory.nasa.gov/NaturalHazards/view.php?id=50347>

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.