PRIMEFOCUS

Tri-Valley Stargazers

February 2011

Meeting Info:
What: Salt Deposits on Earth and Mars: A Case Study on Habitability

Who: Dr. Marilyn Vogel

When:
February 18, 2011
Doors open at 7:00 p.m.
Lecture at 7:30 p.m.

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

Inside

February Meeting

Salt Deposits on Earth and Mars: A Case Study on Habitability

Dr. Marilyn Vogel

Dr. Marilyn Vogel is a biogeochemist at NASA AMES doing research on using Earth's watery environments to understand the potential microbial habitability of areas of Mars. Her focus is the mineralogy and organic chemistry of hypersaline ecosystems. Dr. Vogel looks at how consortia of bacteria can influence mineral types, crystal forms and macroscopic deposits of salts in which the bacteria live. She also studies the organic chemistry of bacterial communities. Together, minerals and organic molecules can be preserved over geologic times. Certain molecules and minerals are biosignatures that can help assess the possibility of life on other planets.

For more information on the Ames Research Center NASA Astrobiology Institute see: http://amesteam.arc.nasa.gov/index.html

---

Caption: The Mars Science Laboratory being assembled in a clean room at the NASA Jet Propulsion Laboratory.

The Mars Science Lander (MSL) is scheduled to launch to Mars at the end of this year, with arrival at Mars in August 2012. There are four landing site possibilities, Eberswalde Crater, Gale Crater, Holden Crater, and Mawrth Vallis. All of these sites are at least 1450-4451 meters below the mean elevation of the Martian surface to ensure a substantial amount of atmosphere for the parachute to slow the lander's descent.

Once on the surface the MSL is scheduled to operate for one Martian year. "By determining the mineralogy of rocks and soils, CheMin will assess the involvement of water in their formation, deposition, or alteration. In addition, CheMin data will be useful in the search for potential mineral biosignatures, energy sources for life or indicators of past habitable environments. CheMin can unequivocally identify and quantify minerals above its detection limits in complex natural samples such as basalts, multicomponent evaporite systems, and soils." For more details see: http://msl-scicorner.jpl.nasa.gov/Instruments/CheMin/

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
Feb. 18	Feb. 21	
Mar. 18	Mar. 21	Feb. 25
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

Treasurer David Feindel indicates that as of the February 12, 2011 the TVS account balances are:

Checking	$5,823.09
CD #1	$3,763.79 rolled over 2/17/2011
CD #2	$2,656.35 rolled over 2/17/2011

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.

RASC Handbooks and Calendars Available

David Feindel has Royal Astronomical Society of Canada (RASC) Handbooks and Calendars for purchase. The pricing is the same as last year--$22 for the Handbook, $15 for the Calendar. Pictures of them are available on the www.rasc.ca website.

Journal Club by Ken Sperber

The Magellanic Clouds grace the skies of our brethren in the Southern Hemisphere. Given that the Large Magellanic Cloud (LMC) and the Small Magellanic Cloud (SMC) are the closest galaxies to the Milky Way, you'd think that their relationship to the Milky Way would by now be well-defined. What is not known is if the LMC and SMC are in orbits bound to the Milky Way, or if they are unbound and just brief interlopers in our galactic neighborhood.

There are numerous factors that complicate the determination of the orbits of the LMC and SMC. These include, but are not limited to, (1) measuring the velocities of the Magellanic Clouds relative to the Milky Way, and (2) the distribution of dark matter in and around the Milky Way which will affect the escape velocity from the Milky Way.

It is known that the LMC and the SMC are part of the greater Magellanic Stream, which is a 600,000 light year long stream of gas that traces out the orbit of the LMC and SMC (see page 6 for a composite optical/radio image of the Milky Way, the LMC, and the SMC). There is a bridge of material "connecting the LMC and SMC, and there is also a leading arm that precedes the LMC and SMC in their orbit. Models of the LMC and SMC interactions with the Milky Way must represent the tidal interactions that gave rise to these tidal streams.

Traditional models of the LMC and SMC have been "assigned" bound orbits to explain the tidal features. In these older models the tidal stripping is dominated by interaction with the Milky Way. However, the veracity of these models is called into question since the larger value of recent Hubble Space telescope proper motion velocities of the LMC and SMC are incompatible with the traditional models. As used in the traditional models the upward revised velocities result in the LMC and SMC being in unbound orbits.

J. Diaz and K. Bekki have used the revised velocities and what is believed to be a more realistic distribution of dark matter in their model. Their model indicates the LMC and SMC have been bound to the Milky Way for at least 5 billion years, and they produce the tidal structures that we observe today. Their model suggests that prior to 5.5 billion years ago the LMC and SMC were separated by ~600,000 light years, thus suggesting that the LMC and SMC may have originally been independent satellites of the Milky Way. They closely interacted 1.2 and 0.25 billion years ago, coming within ~20,000 and ~14,000 light years of each other, respectively, at which time they became a bound pair of galaxies. During these close passages the Magellanic Stream and leading arm were stripped from the SMC by the LMC.

In a more recent version of their model they have incorporated gas drag and self-gravity, resulting in better agreement with observations for the ratio of the mass of Magellanic Stream to the leading arm, and it gives a better representation of the bifurcated structure of the Magellanic Stream.

For more information see: http://arxiv.org/PS_cache/arxiv/pdf/1101/1101.2500v1.pdf, http://www.universetoday.com/83126/astronomy-without-a-telescope-situation-cloudy/ and http://www.nrao.edu/pr/2010/magstream/

Header Image: The Large Magellanic Cloud imaged in H-alphaRGB from Koornlandskloof Guest Farm, South Africa. The equipment used included: SBIG STL-11000 (LRGB), Starlight Xpress SXV-H9, Lens : Rubinar 300 mm f/4.5 (LRGB), Minolta 300 mm f/2.8. Photo credit: Axel Mellinger (see: http://canopus.physik.uni-potsdam.de/~axm/photo.cgi?Image=images/LMC_300mm_HaLRGB)

Calendar of Events

February 16, 12:00 - 1:00 pm

What: Science Fiction as a bridge between Future Societies and the Contemporary Russian and American Cultures
Who: Larisa Mikhaylova, Lomonosov Moscow State University
Where: New SETI Headquarters, 189 N. Bernardo Ave., Mountainview
Cost: Free

Dr. Mikhaylova will discuss images from science fiction literature and films which have addressed human interaction in space (created by Frederick Pohl, Ivan Yefremov, Arthur C. Clarke, in Star Trek, Avatar, etc.). Is international cooperation essential for humans to move into the Universe – or not? Has the time arrived to build burgers on Mars? Dr. Mikhaylova will discuss the results of recent internet contests of SF about space in Russia and the 'Back to the Future' contest conducted by NASA. Ethical aspects of space exploration are manifold, and there is hope that looking at human conflicts from an extraterrestrial angle still may help to solve pressing problems today and create a livable future.

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

February 17, 7:30pm

What: EPOXI and Comet 103P/Hartley 2
Who: Michael A'Hearn, Distinguished Professor, Astronomy Department, University of Maryland
Where: New SETI Headquarters, 189 N. Bernardo Ave., Mountainview
Cost: Free

The Deep Impact Flyby Spacecraft flew past comet Hartley 2 on 4 November 2010. Yet again a cometary flyby has led to numerous surprises that will yet again change our understanding of the role of comets in the formation of the solar system and our understanding thereof. This talk will highlight the new knowledge gained from the flyby. By the time of this talk, Stardust NExT will have flow past comet 9P/Tempel 1 (on 15 April PST) and the new data on the cometary nucleus onto which Deep Impact delivered its Impactor Spacecraft 5 years ago. Preliminary results from that flyby will also be described.

February 19, 1pm and 3pm

What: Celebrating Black History Month: Challenger Missions
Who: You (ages 8 and up)
Where: Chabot Space & Science Center, 10000 Skyline Boulevard, Oakland
Cost: Guests: $10 + General Admission, Members: $10; Register: (510) 336-7373.

Guided by an experienced flight director, command your own destiny while developing skills in decision making, teamwork, problem solving, and communication. Reserve your space today! A short presentation highlighting the contributions of African American astronauts will be featured before each mission.

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

February 21 7:30 pm

What: Planet Factories: Disks of Formation Around Young Stars
Who: Dr. Aaron Boley, Researcher at the Univ. of Florida
Where: California Academy of Science, 55 Music Con-

continued page 4

course Dr., Golden Gate Park, San Francisco, CA
Cost: Adults $12, Seniors $10, Academy members $6. Reserve a Space Online or call 800-794-7576

Dr. Boley is a theoretical astrophysicist working in the fields of planet formation, disk evolution, and early star formation. In this lecture, he will explore the formation of disks around newly-born stars, investigate how these disks evolve, and discuss their role in building the variety of planetary systems now known to exist.

See http://www.calacademy.org/events/lectures/ for more information.

February 23, 12:00 - 1:00 pm

What: The Evolution of Saturn's F Ring
Who: Rob French, SETI Institute
Where: New SETI Headquarters, 189 N. Bernardo Ave., Mountainview
Cost: Free

Saturn's rings are one of the most spectacular objects in the solar system. Analysis of their origin, evolution, and eventual demise can provide insight into the formation of our solar system as well as planetary formation processes in general. This talk will provide a brief overview of the ring systems of the giant planets, the basic principles of photometry, and how we have applied photometry to Saturn's F ring. The F ring shows a dramatic change in brightness from the Voyager era to the Cassini era, and we attribute this change to perturbations by the nearby moon Prometheus. The talk will conclude by presenting some basic information about these perturbations and how they may have caused this change.

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

March 2, 12:00 - 1:00 pm

What: Sand Seas in the Solar System
Who: Lori Fenton, Carl Sagan Center and SETI Institute
Where: New SETI Headquarters, 189 N. Bernardo Ave., Mountainview
Cost: Free

There are four worlds in our Solar System that have substantial atmospheres and observable surfaces: Venus, Earth, Mars, and Titan. The effects of an atmosphere interacting with a surface are clear: each of these planetary bodies has sand seas covering some fraction of its surface. Hidden within the morphology of these dunes lies a record of climate change that scientists are only beginning to understand.

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

March 8, Evening-Check Time

What: Small planets are common: evidence from the Eta-Earth Survey and the Kepler mission
Who: Andrew Howard, Astronomy Department, UCB
Where: New SETI Headquarters, 189 N. Bernardo Ave., Mountainview
Cost: Free

Most planets are thought to form through the 'core accretion' process. This process can be probed by comparing the occurrence rates of extrasolar planets of different masses and orbital distances. Until recently, the evidence was limited to massive, Jovian planets. This talk will focus on recent results that probe much smaller planets: 1) the Eta-Earth Survey, a radial velocity planet search that provides a census of nearby extrasolar planets with masses of 3-1000 Earth-masses; and 2) the Kepler mission, which detects transiting planets with sizes down to one Earth radius. We are learning that close-in, 'super-Earth'-size planets are ubiquitous and that the models of planet formation and migration need substantial revision to account for them.

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

March 10, 7:00-8:30pm

What: The Many Mysteries of Antimatter
Who: Helen quinn, Ph.D., Stanford University
Where: Foothill College, Smithwick Theater, El Monte Road and Freeway 280, in Los Altos Hills, CA
Cost: Free, $2 parking (bring change for meters)

Antimatter is just like matter with all its properties reversed. But when antimatter meets a matching amount of matter, they destroy each other, both turning suddenly into energy. Scientists think there may have been equal amount of matter and antimatter in the early universe, and yet today we have lots of matter and very little antimatter. How and when that imbalance developed is one of the great mysteries in understanding the underlying properties of the universe. Dr. Quinn, who is co-author of the definitive popular book on antimatter, will discuss the history of our understanding of antimatter and how we use the little bit of antimatter around today to study some of the highest energy processes among the stars and galaxies. One particularly interesting possible source of antimatter is the annihilation or decay of "dark matter" particles, mysterious material that is thought to make more of the universe than regular matter. She will also discuss ongoing antimatter experiments that are helping to put limits on the nature and behavior of dark matter.

See http://www.foothill.edu/ast/SVL.htm for more information, or call (650) 949-7888.

March 15, 3:00 - 5:00 pm

What: Planetary Science Decadal Survey Rollout Town Hall Meeting

continued page 5

Who: Scott Hubbard (Stanford and SETI) and Dale Cruikshank (NASA Ames)
Where: New SETI Headquarters, 189 N. Bernardo Ave., Mountainview
Cost: Free

The Solar System Decadal Survey report for 2013-2022 will be made public in a presentation on March 7 at the Lunar and Planetary Science Conference in Houston, and the document will be available on the website of the National Research Council from that time onward.

The Decadal Survey report is advisory to NASA and the NSF. The core of the report consists of a prioritized list of recommended flight missions and research directions, as well as recommendations for research facilities and data archiving. The report is a result of two-year effort of several committees working with the Steering Committee, and extensive community input through more than 100 white papers addressing every component of Solar System studies.

Two of the members of the Survey's Steering Committee, Dale Cruikshank (NASA Ames) and Scott Hubbard (Stanford University), will make a presentation and respond to questions in the two-hour meeting.

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

March 16, 12:00 - 1:00 pm

What: Earth science collaborative for ecological forecasting
Who: Ramakrishna Nemani, NASA Ames Earth Science Division
Where: New SETI Headquarters, 189 N. Bernardo Ave., Mountainview
Cost: Free

There is increasing pressure on the science community not only to understand how recent and projected changes in climate are likely to impact our global environment and the natural resources on which we depend, but also to design solutions to mitigate or cope with the likely impacts. Responding to this multi-dimensional challenge requires new tools and research frameworks that assist scientists in collaborating to rapidly investigate complex, interdisciplinary science questions of critical societal importance. Dr. Nemani will describe one such collaborative research framework, funded through the American Recovery and Reinvestment Act, within the National Aeronautics and Space Administration Earth sciences program called NASA Earth Exchange (NEX). NEX combines state-of-the-art supercomputing, Earth system modeling, remote sensing data from NASA and other agencies, and a scientific social networking platform to deliver a complete work environment in which users can explore and analyze large Earth science data sets, run modeling codes, collaborate on new or existing projects, and share results within and/or among communities. Dr. Nemani will show that through NEX his group hopes to lower the barrier of entry to data/compute intensive science and provide a mechanism for continuous engagement among members of the global change science community.

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)

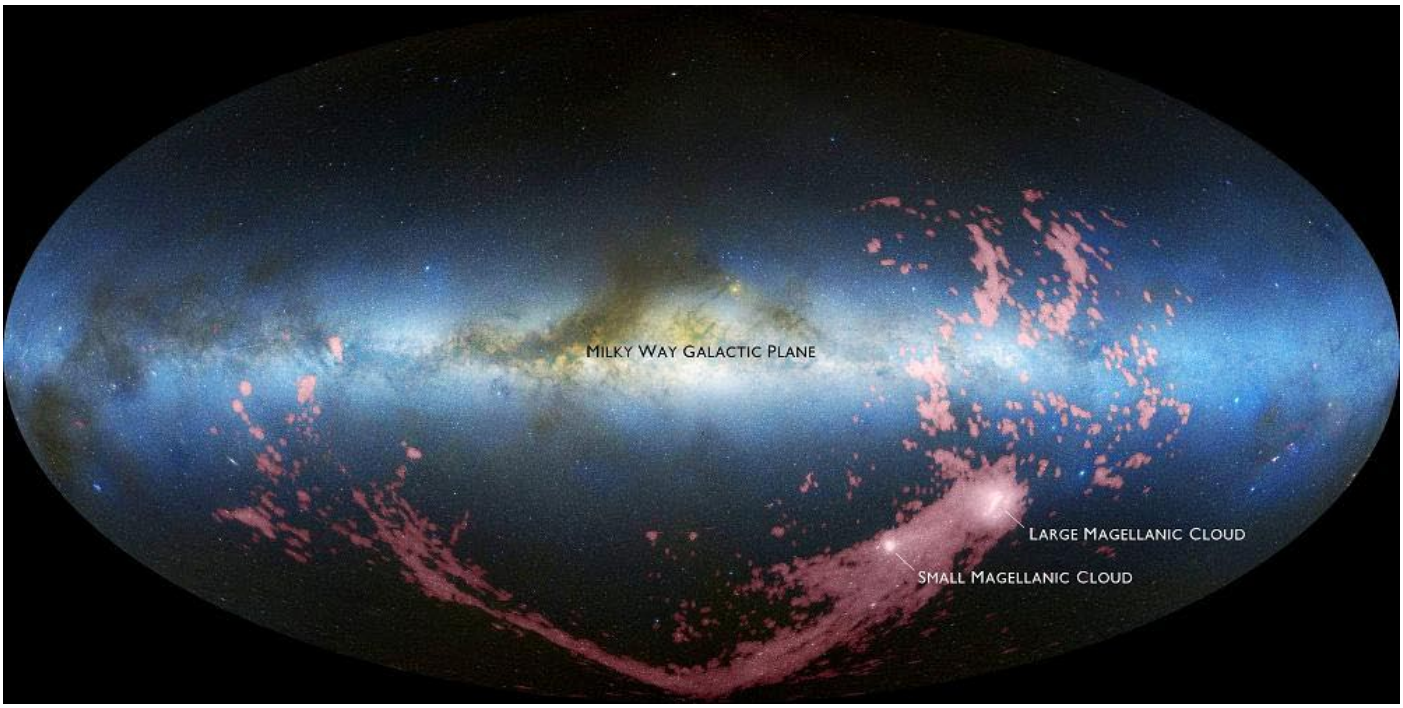
All times Pacific Standard, unless otherwise noted.

February

17	Thu	Neptune in conjunction with the Sun (not visible)
18	Fri	Full Moon (12:36am)
21	Mon	Saturn 7 degrees north of the Moon
24	Thu	Last-Quarter Moon (3:26pm)

March

1	Tue	Algol, an eclipsing binary, is at minimum brightness, magnitude 3.4 for ~2 hours centered at 9:03pm
4	Fri	New Moon (12:46pm)
5	Sat	Use binoculars to see Mercury to the lower-left of the crescent Moon (shortly after sunset)
6	Sun	Jupiter located to the left of the crescent Moon (dusk)
12	Sat	First-Quarter Moon (3:45pm)
13-28	Sun-	Best opportunity of the year to see Mercury, which passes to the right of Jupiter on 13-16(dusk)
18	Fri	Full Moon (11:10am PDT)



Caption: Combined radio/optical image shows Milky Way, Magellanic Clouds, and the new radio image of the Magellanic Stream. Blue and white are the Milky Way and Magellanic Clouds. Red is the hydrogen gas in the Magellanic Stream, in the disks of the Magellanic Clouds, and in the stream's Leading Arm. The Milky Way is horizontal in the middle of the image; the Magellanic Clouds are the light spots at the center-right portion of the image, from which the gas stream originates. Brown is dust clouds in the Milky Way
CREDIT: Nidever, et al., NRAO/AUI/NSF and A. Mellinger, Leiden-Argentine-Bonn Survey, Parkes Observatory, Westerbork Observatory, Arecibo Observatory.
See: http://www.nrao.edu/pr/2010/magstream/

Planets in Strange Places

By Trudy E. Bell

Red star, blue star, big star, small star—planets may form around virtually any type or size of star throughout the universe, not just around mid-sized middle-aged yellow stars like the Sun. That's the surprising implication of two discoveries in 2006 from the 0.85-meter-diameter Spitzer Space Telescope, which is exploring the universe from orbit at infrared (heat) wavelengths blocked by the Earth's atmosphere.

At one extreme are two blazing, blue "hypergiant" stars 180,000 light-years away in the Large Magellanic Cloud, one of the two companion galaxies to our Milky Way. The stars, called R 66 and R 126, are respectively 30 and 70 times the mass of the Sun, "about as massive as stars can get," said Joel Kastner, professor of imaging science at the Rochester Institute of Technology in New York. R 126 is so luminous that if it were placed 10 parsecs (32.6 light-years) away—a distance at which the Sun would be one of the dimmest stars visible in the sky—the hypergiant would be as bright as the full moon, "definitely a daytime object," Kastner remarked.

Such hot stars have fierce solar winds, so Kastner and his team are mystified why any dust in the neighborhood hasn't long since been blown away. But there it is: an unmistakable spectral signature that both hypergiants are surrounded by mammoth disks of what might be planet-forming dust and even sand.

At the other extreme is a tiny brown dwarf star called Cha 110913-773444, relatively nearby (500 light-years) in the Milky Way. One of the smallest brown dwarfs known, it has less than 1 percent the mass of the Sun. It's not even massive enough to kindle thermonuclear reactions for fusing hydrogen into helium. Yet this miniature "failed star," as brown dwarfs are often called, is also surrounded by a flat disk of dust that may eventually clump into planets. (This brown dwarf discovery was made by a group led by Kevin Luhman of Pennsylvania State University.)

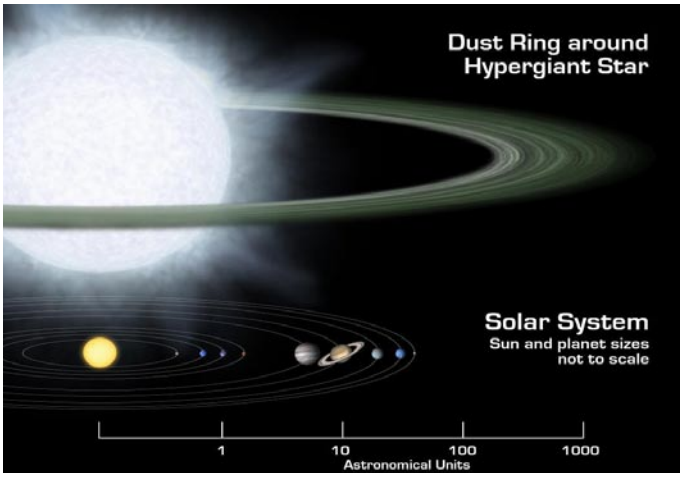
Although actual planets have not been detected (in part because of the stars' great distances), the spectra of the hypergiants show that their dust is composed of forsterite, olivine, aromatic hydrocarbons, and other geological substances found on Earth.

These newfound disks represent "extremes of the environments in which planets might form," Kastner said. "Not what you'd expect if you think our solar system is the rule."

Hypergiants and dwarfs? The Milky Way could be crowded with worlds circling every kind of star imaginable—very strange, indeed.

Keep up with the latest findings from the Spitzer at www.spitzer.caltech.edu. Kids and their grown-up friends can enjoy beautiful images from Spitzer while playing Spitzer Concentration at The Space Place (spaceplace.nasa.gov/en/kids/spitzer/concentration).

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: Artist's rendering compares size of a hypothetical hypergiant star and its surrounding dusty disk to that of our solar system.

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.