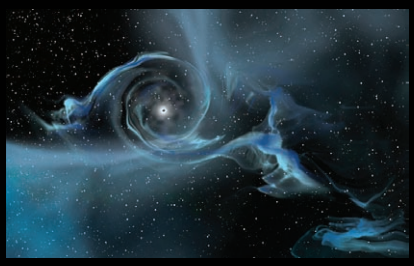
PRIMEFOCUS
Tri-Valley Stargazers

May 2012



TVS
Tri-Valley Stargazers

Meeting Info

What:
Einstein for Everyone

Who:
Dr. Robert Piccioni

When:
May 18, 2012
Doors open at 7:00 p.m.
Lecture at 7:30 p.m.

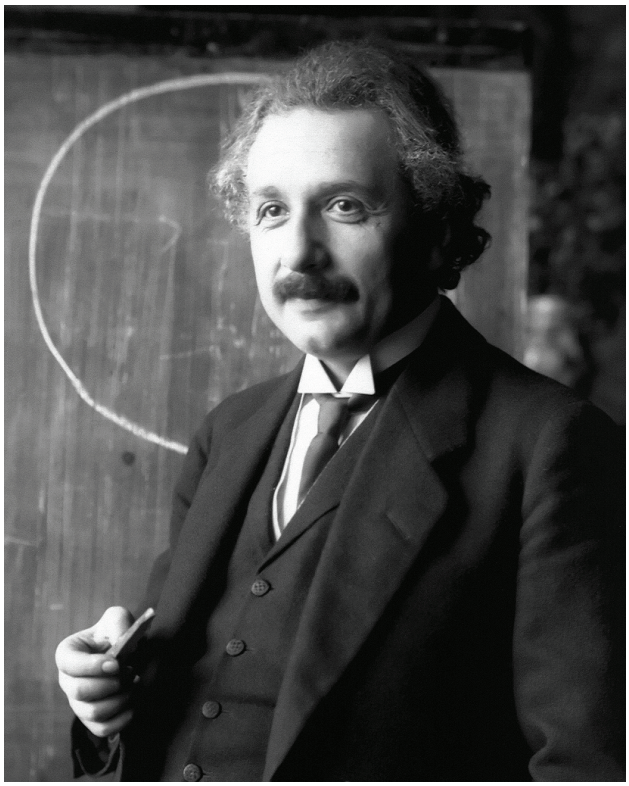
Where:
Unitarian Universalist
Church in Livermore
1893 N. Vasco Road

Inside

May Meeting

Einstein for Everyone

How did a young rebel, who seemed doomed to fail, overcome rejection to become the world's most famous scientist? In plain English, what do his theories mean? And how does Einstein impact our lives through DVDs, GPS, CCD imaging and digital cameras, computers, and smarter energy?



Caption: Albert Einstein during a lecture in Vienna in 1921. Photo Credit: Ferdinand Schmutzer; Public Domain: http://commons.wikimedia.org/wiki/File:Einstein_1921_portrait2.jpg

Our speaker, Dr. Robert Piccioni, graduated from Caltech, has a Ph.D. in high-energy physics from Stanford University, and was on the faculty of Harvard. Robert ran eight high-tech companies and holds patents in medical equipment, microelectronics, and smart energy. Since "retiring", his mission is making science accessible. Robert teaches at the Osher Institute at UCLA and Cal. State Channel Islands, where he was voted "Teacher of the Year". He is the author of three books that won national and international competitions and have the highest ratings in their categories on Amazon.com.

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**
May 18	May 21	
Jun. 15	Jun. 18	May. 25
Jul. 20	Jul. 23	Jun. 29
Aug. 17	Aug. 20	Jul. 27
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 February 17, 2012 the TVS account balances are:

Checking	$13,578.81
CD #1	cashed in as part of consolidating of CD's
CD #2	cashed in as part of consolidating of CD's

Star Party Requests/Participation

Numerous requests for star parties have been made to TVS. If you can assist by bringing a scope and/or sharing your knowledge and enthusiasm for astronomy, please contact the TVS organizer below:

Friday, May 25, 8:15-10:00pm: Murray Elementary School, Dublin. Contact: Debbie Dyke (astrodeb"at"comcast.net)

Thursday, July 19, 8:45-10:00pm: Pleasanton Library. The star-party follows a talk by Dr. Kevin Manning presenting his program, "Astronomy for Everyone: Size & Scale of the Universe," from approximately 7:00-9:00pm. Contact Wayne Miller (Star Party Coordinator; starpartytvs"at"gmail.com)

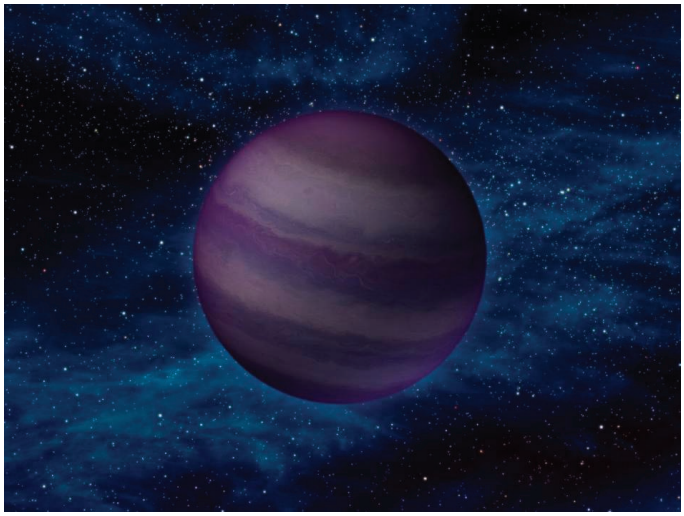
Journal Club by Ken Sperber

The Runt of the Litter

If you are interested in astronomy, you've probably heard the moniker "Oh, Be A Fine Girl/Gentleman, Kiss Me" to remind yourself of the classification of stars from the hottest and most massive (O-type) to the coolest and least massive (M-type). This stellar classification scheme, known as the Harvard Spectral Classification, was proposed in 1901 by Annie Jump Cannon. It was a synthesis of earlier classification approaches that were developed by Father Angelo Secchi and Edward C. Pickering, with contributions from many other astronomers. It wasn't until the 1920's, when Meghnad Saha applied his theory of ionization to the solar chromosphere, that Cecilia Payne demonstrated that the OBAFGKM classification represented a sequence of temperature.

As our imaging capabilities have become more sensitive and broader in wavelength (infrared detection, especially), new classes of "stars" have been discovered, and the Harvard Spectral Classification system has been extended to include dwarf-stars of type L, T, and Y. Dwarf-stars are not massive enough to support hydrogen fusion, and are sometimes referred to as "failed stars" (Note: some L-type bodies are massive enough to support fusion and are referred to as L-stars rather than L-dwarfs). As a group, the failed stars are referred to as Brown Dwarfs.

L-dwarfs have temperatures of 1300-2000K, and have prominent spectral lines that indicate the presence of metal hydrides and alkali metals. T-dwarfs have temperatures between 700-1300K, with infrared spectral lines of methane present. Y-dwarfs are the coolest (in terms of temperature, and especially if you study them) of the Brown Dwarfs, with temperatures of 500-700K. A spectral absorption feature at 1.55 microns indicates the presence of ammonia or a combination of water and methane.



Caption: Artist's concept of a Y-Dwarf, the coldest type of Brown Dwarf. Image Credit: NASA/JPL-Caltech

Two possible mechanisms have been proposed for the formation of Brown Dwarfs: (1) Direct collapse of a low mass molecular cloud, and (2) "disk fragmentation is responsible for the formation of low mass and substellar objects in the vicinity of a forming star." In this latter scenario, the Brown Dwarf would form from the disk fragment, and then be ejected due to gravitational interactions within the host star's disk. A shortcoming of mechanism 1 is that such small low mass molecular clouds are unlikely to have sufficient

Header Image: Artist's concept of a black hole siphoning gas from a companion star. Image Credit: NASA E/PO, Sonoma State University, Aurore Simonnet. For more information see: http://www.nasa.gov/audience/forstudents/k-4/stories/what-is-a-black-hole-k4.html

Journal Club (continued)

gravitational potential energy to collapse to form a Brown Dwarf (unless a strong shockwave or a strong magnetic field were present to contribute to contraction). A shortcoming of mechanism 2 is that the simulated ejection velocities of the Brown Dwarfs would be too high to account for the lower observed velocities of Brown Dwarf's and their close proximity to Young Stellar Objects.

Basu and Vorobyov (2012, The Astrophysical Journal, in press) have investigated these proposed mechanisms of Brown Dwarf formation using a hydrodynamical numerical model. The model is configured to simulate star formation from the collapse of a large cloud core. The central 6 AU (astronomical unit, 1AU = average Sun-Earth distance) of the cloud core is taken to represent the central star and some circumstellar disk material that is forming in the cloud core. The authors produced a large number of simulations using different initial conditions for the cloud mass and angular momentum. Their novel result is that these large cloud cores can fragment, and gravitational interaction between the fragmented gaseous clumps and with the primary core can eject a gaseous clump from which the Brown Dwarf subsequently forms. An important ramification of this result is that it accounts for the formation of disks around Brown Dwarfs, and also "qualitatively why the Brown Dwarfs are less numerous than stars, since the ejections only occur for some region of parameter space." The results also indicate that the population of Brown Dwarfs "could contribute at least part of the budget for the universe's missing dark matter." Furthermore, since the simulations show that ejection of cloud cores is routine, this may have implications for the size of first generation stars. The conventional belief is that first generation stars may have reached masses of several hundred solar masses. Since the new calculations indicate that gaseous clumps can be ejected, first generation stars may not have reached such mammoth proportion.

For more information see: http://communications.uwo.ca/western_news/stories/2012/April/astrophysicist_uncovers_secret_origin_of_brown_dwarfs.html, http://www.universetoday.com/95010/the-secret-origin-story-of-brown-dwarfs/, and http://en.wikipedia.org/wiki/Stellar_classification

Calendar of Events

May 16, Noon - 1:00pm

What: The Climates of the Planet Mars
Who: Francois Forget, Laboratoire de Météorologie Dynamique
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

At the present time, Mars is a dry and cold planet. Surface ice is unstable for more than one season outside the polar regions, and the atmosphere is so cold or so dry that the presence of liquid water, never detected, is unlikely anywhere on the surface.

Things may have been different in the past. On the one hand, the surface of Mars is characterized by multiple geological evidences that suggest that various kind of glaciers and ice sheets formed not that long ago at low and mid-latitudes. On the other hand, the observations of the geology and mineralogy of the oldest surface on Mars (dating back to more than 3.8 billion years ago) provide evidence that the Martian climate was then completely different, with abundant liquid

continued page 4

water on the surface.

To help understand what may have happened, we have developed global climate models designed to simulate the possible past Martian environment. These simulations unveil parts of Mars history, but also raise new questions.

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

May 20, 5:00pm-8:00pm

What: Solar Eclipse Viewing Party
Who: Chabot Staff
Where: Chabot Space & Science Center, 10000 Skyline Blvd., Oakland, CA 94619
Cost: Guests and Members: $5 after 5:00pm

Join us as we observe the Solar Eclipse 2012. Watch as the Moon passes in front of the Sun, a beautifully rare sight in the Bay Area. Get a view from the rooftop of the East Bay hills on our Observatory Deck, with maximum eclipse at 6:32pm. Engage in hands-on solar projects, make a pin-hole camera, solar viewing, see a Planetarium show, and converse with experienced astronomers. Special extended hours on our Observatory Deck until 8pm!

For more information see: http://www.chabotspace.org/events.htm

May 23, 7:00pm

What: Astrobiology at the Carl Sagan Center
Who: David Morrison, Director of the Carl Sagan Center for Life in the Universe
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

Details of this talk are unavailable.

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

May 26, 3:30pm

What: Tales of the Maya Skies: Director and Producer Q&A
Who: Director and Producer
Where: Chabot Space & Science Center, 10000 Skyline Blvd., Oakland, CA 94619
Cost: Free with General Admission

Join us after the 3:30pm showing of Tales of the Maya Skies for discussion and Q&A with the director and producer of the show.

Immerse yourself in the beauty of the "eighth wonder of the world", Mexico's Chichen Itza. Hear the story of the ancient Maya civilization in our full-dome planetarium show Tales of the Maya Skies. Narrated by Grammy Award winner and Oscar nominee Lila Downs, this show transports us to the jungles of Mexico, presenting the rich history and culture of the ancient Maya.

For more information see: http://www.chabotspace.org/events.htm

May 26, 8:30pm

What: Sustainability Base
Who: Krisstina Wilmoth, NASA-Ames Research Center
Where: Mt. Tamalpais State Park, Cushing Memorial Amphitheater, more commonly known as the Mountain Theater, Rock Spring parking area
Cost: Free

NASA is using lessons and innovations from space exploration to build the government's greenest building on Earth. Sustainability Base will be an evolving exemplar for the future of buildings.

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

May 30, Noon-1:00pm

What: Planet formation and stellar multiplicity: insights from recent surveys and perspectives
Who: Gaspard Duchene, UC Berkeley
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

It is now becoming increasingly clear that planetary systems are also frequent around Main Sequence stars. This raises the natural question of the connection between stellar multiplicity and planet formation, a topic that was mostly ignored until the last few years. Does the presence of a stellar companion alter, prevent or promote the formation of planets? In which way? Characterizing observational trends as a function of the stellar companion's mass and orbital properties can help identify the most important physical effects induced by the companion, if any. In this talk, I will review some key results from a number of recent surveys based on the Spitzer, Kepler and Herschel space observatories, as well as ground-based facilities. Building on these surveys, I will propose that, while planetary systems exist in a very diverse range of multiple stellar systems, they may not all form through the same process.

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

June 1, 6:00pm

What: Moonlight Hike
Who: Hiking Guide
Where: Chabot Space & Science Center, 10000 Skyline

Calendar of Events (continued)

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.chabotspace.org/events.htm

June 4, 2:00-5:00am

What: Partial Lunar Eclipse
Who: Director and Producer
Where: Chabot Space & Science Center, 10000 Skyline Blvd., Oakland, CA 94619
Cost: $3 suggested donation

Early birds get the... dark. View this partial lunar eclipse from our Observatory Deck in the wee hours of Monday morning. The eclipse will be most visible from 2:59am to 4:03am. Engage in conversation with our astronomers and knowledgeable volunteers as you witness the Moon's passing behind the Earth. This is one obstruction where the view is actually clear.

For more information see: http://www.chabotspace.org/events.htm

June 4, 7:30pm

What: New Views of Solar Coronal Mass Ejections: Understanding the Origins of Space Weather
Who: Dr. Thomas Berger, Lockheed Martin Solar and Astrophysics Laboratory
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

In the past five years, solar physics has entered a golden age in which visible light, extreme ultraviolet (EUV), and X-ray solar telescopes are viewing the Sun continuously, and from multiple angles, from space. Dr. Berger will show recent observations from the Japanese/US/UK Hinode mission, and the NASA STEREO and Solar Dynamics Observatory (SDO) missions that reveal strange new flows in solar prominences and coronal cavities, the structures that comprise so-called "coronal mass ejections" or CMEs. CMEs are the drivers of all large particle and magnetic storms in the solar system and understanding, and ultimately predicting, this "space weather" is a major goal of modern space physics.

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

June 6, Noon-1:00pm

What: Machine Learning for Exploring Data Streams: Lessons from the VLBA
Who: David Thompson, Machine Learning and Instrument Autonomy, JPL
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

Next-generation science instruments such as the SKA, LSST, and terrestrial sensor networks will dramatically increase the volume of collected data. This enables detection of very rare transient anomalies, but also creates new challenges since comprehensive storage is impossible and analysis must occur in real time.

Dr. Thompson will discuss machine learning approaches for online anomaly detection in data streams. Pattern recognition triages the incoming data for comprehensive analysis of candidate events, retaining robustness against changing noise conditions and interferences. Examples from radio astronomy (the Very Long Baseline Array Fast Transients Experiment) demonstrate the practical benefits of an adaptive approach.

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

June 13, 7:00pm

What: The Sutter's Mill meteorite fall in California's Gold Country on 22 April 2012
Who: Peter Jenniskens, SETI Institute
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

On April 22, 2012, a few meter sized asteroid crashed in our atmosphere. It broke into fragments, pieces of which were seen falling down over the Colama/Lotus region by Doppler weather radar. The recent fall of the meteorites has created a rush in the area, and now many are trying to recover the precious space rocks. Those turn out to be of a primitive carbonaceous chondrite type, the very meteorites that scientists love to study to learn about prebiotic compounds for the origin of life. SETI Institute meteor astronomer Dr. Peter Jenniskens, who runs a night-time video surveillance network in that area to map meteor showers and who found the second recovered meteorite from this fall, will talk about the efforts made by NASA Ames Research Center and the SETI Institute to coordinate the recovery and learn as much as possible about the asteroid that shook people's imagination.

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.

May

3-4	Thu-	The Moon, Saturn, and Spica in conjunction
5	Sat	Full Moon, largest of 2012 (8:35pm)
12	Sat	Last-Quarter Moon (2:47pm)
20	Sun	Annular Solar Eclipse, partial phase visible from Bay area, Annular centerline located about 30 miles north of Redding, CA (Eclipse begins at 5:15pm; Maximum Eclipse at 6:32pm; Eclipse ends at: 7:40pm; see p.50 S&T May 2012)
20	Sun	New Moon (4:47pm)
28	Mon	First-Quarter Moon (2:57am)
31	Thu	The Moon, Saturn, and Spica in conjunction

June

3	Sun	The Moon 4 degrees above Antares
4	Mon	Partial (38%) Lunar Eclipse (Enters Umbra at 3:00am; Exits Umbra at 5:07am); Full Moon (4:12am)
5	Tue	Venus Transits the Sun (1st Contact: 3:05pm; 3rd Contact: After sunset; see p. 50 S&T June 2012). The next Venus transit is in 2117, so plan accordingly!!!
11	Mon	Last-Quarter Moon (3:41am)
14-30	Thu-	Mercury visible, more than 9 degrees above the western horizon (Dusk)
16	Sat	Crescent Moon forms a triangle with Jupiter and The Pleiades (Dawn)
19	Tue	New Moon (8:02am)
20	Wed	Summer Solstice, longest day of the year in the Northern Hemisphere (4:09pm)
21	Thu	Crescent Moon forms a wavy with Mercury, Castor, and Pollux
25-27	Mon	Moon passes below Mars on the 25th-26th, and below Spica and Saturn on the 27th (Evening)
26	Tue	First-Quarter Moon (8:30pm)
29	Fri	Pluto at opposition

NASA Helps Europe Study a Comet–Up Close and Personal

By Dr. Tony Phillips

Europe's Rosetta spacecraft is on its way to intercept comet 67P/Churyumov-Gerasimenko. Comets have been intercepted before, but this mission is different. Rosetta aims to make history by landing a probe on the comet's surface while the mother ship orbits overhead.

"Rosetta is the European equivalent of a NASA flagship mission," explains Claudia Alexander, project scientist for the U.S. Rosetta Project at NASA's Jet Propulsion Laboratory. "It will conduct the most comprehensive study of a comet ever performed."

Rosetta's payload contains 21 instruments (11 on the orbiter, 10 on the lander) designed to study almost every aspect of the comet's chemistry, structure, and dynamics. Three of the sensors were contributed by the U.S.: Alice (an ultraviolet spectrometer), IES (an ion and electron sensor), and MIRO (a microwave sounder).

The main event of the mission will likely be the landing. The 100-kg lander, which looks a bit like a cross between NASA's old Viking Mars landers and a modern microsatellite, will spend two weeks fastened to the comet's icy surface. The European-built probe will collect samples for analysis by onboard microscopes and take stunning panoramic images from ground level.

"First the lander will study the surface from close range to establish a baseline before the comet becomes active," explains Alexander. "Then the orbiter will investigate the flow of gas and dust around the comet's active, venting nucleus."

Rosetta's sensors will perform the experiments that reveal how the chemicals present interact with one another and with the solar wind. Alice and MIRO detect uncharged atoms and molecules, while IES detects the ions and electrons as the solar wind buffets the nucleus.

One problem that often vexes astronomers when they try to study comets is visibility. It's hard to see through the dusty veil of gas billowing away from the heated nucleus. The microwaves MIRO detects can penetrate the dust, so MIRO can see and measure its target molecules even when other instruments can't.

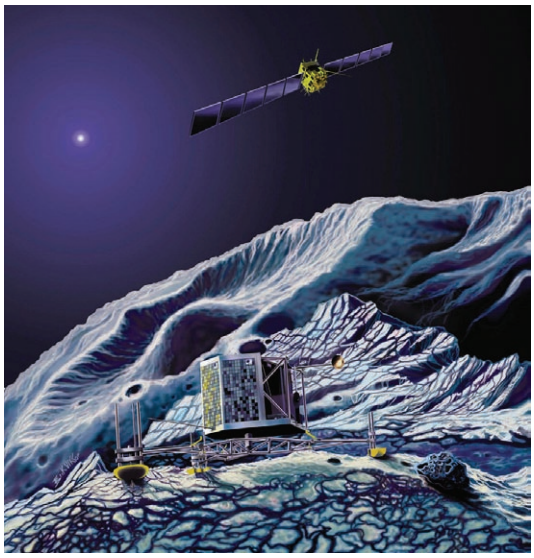
MIRO is one of several experiments focused on the comet's structural properties. It will determine the comet's dielectric constant, emissivity, and thermal conductivity to determine whether it is made of a powdery loose material, has a detectable layer of loose material, or is hard as rock.

"We want to find out whether comets have retained material from when the solar system formed," says Alexander. "If the ancient materials are still there, we can get an idea of what conditions were like at the dawn of the solar system."

Rosetta enters orbit in 2014. Stay tuned for updates!

Check out "Comet Quest," the new, free iPhone/iPad game that has you operating the Rosetta spacecraft yourself. Get the link at spaceplace.nasa.gov/comet-quest.

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



Caption: Rosetta's lander Philae will eject from the spacecraft, touch down on the comet's nucleus, and immediately fire a harpoon into the surface to anchor itself so it won't drift off in the weak gravity.

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.