

# PRIMEFOCUS

Tri-Valley Stargazers



July 2017



## Meeting Info

### What:

**On Becoming a  
Spacefaring Society**

### Who:

**Ejner Fulsang**

### When:

July 21, 2017

Doors open at 7:00 p.m.

Meeting at 7:30 p.m.

Lecture at 8:00 p.m.

### Where:

Unitarian Universalist  
Church in Livermore  
1893 N. Vasco Road

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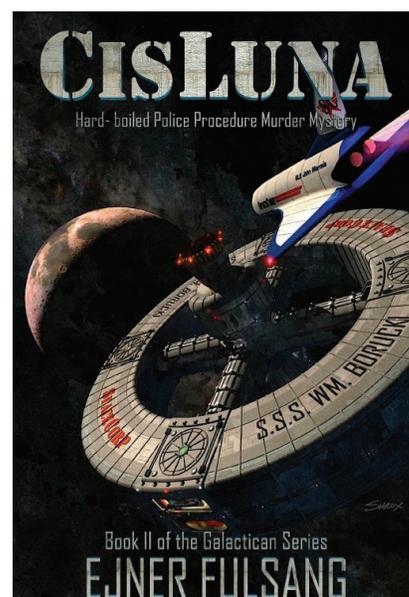
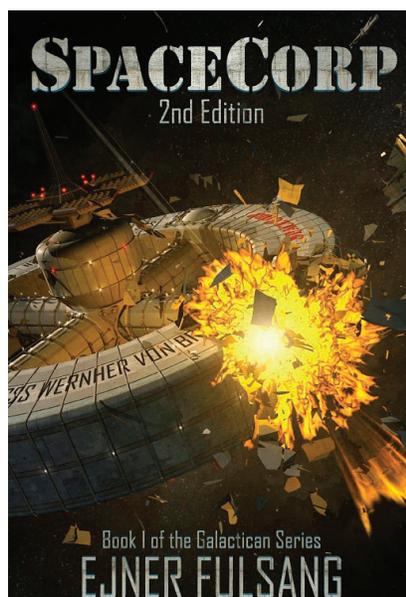
## July Meeting

### On Becoming a Spacefaring Society

**Ejner Fulsang**

If we ever hope to become a true spacefaring society, we must wean ourselves away from chemical rockets. This premise will be proven through an examination of Tsiolkovsky's Rocket Equation, where it will become apparent that adding fuel achieves diminishing returns, but increasing exhaust gas velocity offers rapid transits to Mars, the outer planets, and eventually the nearby stars. There is an upper-limit to the exhaust gas velocity of chemical rockets. To improve on this we must revisit nuclear thermal rockets, and eventually fusion rockets, and finally antimatter rockets. Each of these technologies is feasible although considerable engineering and infrastructure development remains to be done. This technological evolution will be presented in my series of hard SciFi novels in the Galactican Series. This lecture will be delivered at the high school physics level.

Ejner will be offering for sale signed copies of each of his two SciFi novels, SpaceCorp and CisLuna. The price is \$30 for both, or \$15 each. The normal price on Amazon.com is \$19.



Ejner Fulsang has been a tech writer for NASA and SETI for the last ten years. His specialty is helping scientists write proposals for space missions. It's been quite an education, covering topics like spacecraft, instruments, mission design, launch vehicles, and hazards of space. He is particularly intrigued by the possibility of life on other planets and moons, especially the notion of a second genesis where life comes from chemical, not biological origins.

## News & Notes

### 2017 TVS Meeting Dates

The following lists the TVS meeting dates for 2017. 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
Jul. 21	Jul. 24	
August: No General Meeting or Board Meeting		
Sep. 15	Sep. 18	Aug. 25
Oct. 20	Oct. 23	Sep. 29
Nov. 17	Nov. 20	Oct. 27
Dec. 15	Dec. 18	Nov. 24

### Money Matters

As of the last Treasurer's Report on 6/19/17, our club's checking account balance is \$14,252.42.

### Outreach Star Parties: Help Needed.

July 15: Cub Scouts at Rancho Los Mochos

August 12: Cub Scouts at Rancho Los Mochos

September 28: Livermore Library

September 29: RADD at Pleasanton Senior Center

Please contact Eric Dueltgen for more information.

### Club Star Parties: 2017 Summer/Autumn

The following club star parties have been approved by the TVS Board:

July 15: H2O Open House: caravan departs at 6:30pm from the corner of Mines and Tesla Roads (see the club website)

July 22: Tesla Winery star party

August 25 – 27: Yosemite/Glacier Point weekend

September 23: Tesla Winery star party

October 21: Tesla Winery star party (Orionids Meteors).

August 12: Cub Scouts at Rancho Los Mochos

## Calendar of Events

### Present - August 31, 10:00am-5:00pm, Wednesday-Sunday

What: California's First Philanthropist: The Legacy of James Lick

Who: Exhibition

Where: Pioneer Hall at the Presidio, 101 Montgomery, Suite 150, Presidio of San Francisco, 94129

Cost: Free

James Lick used his wealth to establish charitable organizations to address the basic needs of the many who were less fortunate. He willed his entire fortune to benefit the people of California. In addition to endowing existing service organizations, including homes for the elderly, schools for orphans, and The Society for the Prevention of Cruelty to Animals, Lick allocated \$700,000 to build "a telescope superior to and more powerful than any telescope yet made" on Mount Hamilton. Other beneficiaries included the California Academy of Sciences, The Mechanics Library, landmarks in Golden Gate Park, as well as The California School for Mechanical Arts, the first to enroll young women interested in studying industrial design and manufacturing. This exhibition considers the legacy of James Lick, and features images by Isaiah West Taber, who documented many of the projects Lick funded, including the Lick Observatory and the Academy of Sciences.

For more information see: <http://www.californiapioneers.org/museum/today-in-the-museum/>

### July 17, 7:30pm

What: Why?: What Makes Us Curious

Who: Mario Livio, Astrophysicist

Where: California Academy of Science, 55 Music Concourse Dr., Golden Gate Park, San Francisco, CA

Cost: Advanced ticketing required. Academy members \$12, Seniors \$12, General \$15. Reserve a space online or call 1-877-227-1831.

Astrophysicist and bestselling author Mario Livio describes cutting-edge research in psychology and neuroscience in an exploration of the origin and mechanisms of human curiosity. His latest book, "Why?" weaves current findings with fascinating stories of such paragons of curiosity as inventor Leonardo da Vinci and physicist Richard Feynman, alongside interviews with physicist Fabiola Gianotti, astrophysicist/rock guitarist Brian May, linguist Noam Chomsky, and others who weigh in on what drove them to be at the top of their fields.

See [www.calacademy.org/events/benjamin-dean-astronomy-lectures](http://www.calacademy.org/events/benjamin-dean-astronomy-lectures) for lecture and reservation information.

### July 29, 8:30pm

What: Seeing the Beginning: Insights from the Cosmic Microwave Background

Who: Dr. Blake Sherwin, LBNL

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

Cost: Free

Do you ever wish we could look back in time? We can, by studying the cosmic microwave background (CMB), which reveals the fiery early universe when it was only 0.003% of its

Header Image: Amateur-built multi-mirror Alt-Az telescope shown at the RTMC. Presently, it houses one 13-inch mirror, with the goal of populating it with six 12-inch mirrors! Image Credit: Alan Gorski

## Calendar of Events (continued)

present age. This talk will show how studying the CMB allows us to learn about the origin, composition, and ultimate fate of the universe.

For more information see: <http://www.friendsofmetam.org/astronomy/schedule>

### August 4, 6:00pm - 10:00pm

**What:** \$5 First Fridays  
**Who:** Chabot Exhibit  
**Where:** Chabot Space and Science Center, 10000 Skyline Blvd., Oakland, CA 94619  
**Cost:** Chabot Admission \$5, Free for Members

At \$5 First Fridays you can join a Night Hike through the redwoods or enjoy various laser and planetarium shows. Admission also includes hands-on activities and live demonstrations throughout the center, as well as any special events that are going on that evening. It's fun for the whole family!

See [www.chabot.space.org/first-fridays.htm](http://www.chabot.space.org/first-fridays.htm) for more information and to pre-purchase tickets, or call (510) 336-7373.

### August 7, 7:30pm

**What:** The 21st Century: The Century of Biology on Earth and Beyond  
**Who:** Dr. Jill Tarter, SETI Institute  
**Where:** California Academy of Science, 55 Music Concourse Dr., Golden Gate Park, San Francisco, CA  
**Cost:** Advanced ticketing required. Academy members \$12, Seniors \$12, General \$15. Reserve a space online or call 1-877-227-1831.

This century will permit us the first opportunities to study biology beyond Earth; biology as we don't yet know it, and

biology that we have exported off the surface of our planet. The technologies needed for discovering biology beyond Earth are different, depending on whether you are searching for microbes or mathematicians, and depending on whether you are searching in-situ or remotely. In many cases the necessary technologies do not yet exist, but they will probably develop more rapidly - and in more ways - than any one of us can now imagine.

See [www.calacademy.org/events/benjamin-dean-astronomy-lectures](http://www.calacademy.org/events/benjamin-dean-astronomy-lectures) for lecture and reservation information.

### August 26, 8:30pm

**What:** The Search for Life Beyond Earth  
**Who:** Dr. Carol Stoker, NASA Ames  
**Where:** Mt. Tamalpais State Park, Cushing Memorial Amphitheater, more commonly known as the Mountain Theater, Rock Spring parking area  
**Cost:** Free

Besides Earth, several planetary bodies in our solar system are recognized as having the potential to host primitive forms of life. This talk will describe why and how NASA plans to search for life on Mars and the icy moons of Jupiter and Saturn.

For more information see: <http://www.friendsofmetam.org/astronomy/schedule>

## Golden State Star Party

By Rich Combs

The only problem with going to the Golden State Star Party is having to wait a whole year to go back. After a scenic drive of 6+ hours, I arrived at the site in northeastern California, and

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#### Officers

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**Refreshment Coordinator:**  
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**Webmaster:**  
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#### Web & E-mail

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[info@trivalleystargazers.org](mailto:info@trivalleystargazers.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 ([info@trivalleystargazers.org](mailto:info@trivalleystargazers.org)) asking to join the group. Make sure you specify the e-mail address you want to use to read and post to the group.

## TVS Barbecue



Image Caption: TVS members enjoyed a fine barbecue on June 16, 2017. Thanks to Jill Evanko for shopping on behalf of the club, and to the members who brought the delicious side dishes and desserts. Image Credit: Rich Combs

far from the town of Adin, shortly before our treasurer Roland Albers also arrived. Before the weekend was over we would bump into two other current TVS members along with 4 previous TVS members, old friends that I hadn't seen in quite a few years. One of these was Steve Gottlieb, Sky and Telescope contributor and well known NGC hunter, who agreed to be our November speaker. The days were hot, and the time was spent socializing, snoozing, or driving in an air-conditioned car to see the sights of Lassen and Modoc counties. A nearby highlight is Burney Falls, a great place to get away from the heat. Though the number of restaurants is meager, lunches in Bieber and Adin were delicious. Evening meals, Thursday and Friday, were barbecues provided in true western style by the owners of Frosty Acres, as the site is named, who allow us to briefly take over the plateau on their ranch. Saturday was a community fundraiser in Adin, conveniently timed in sync with GSSP, with the best food I've ever had at a picnic.

With our gastronomical needs well taken care of we were ready for 4 dark nights of observing, and although the seeing was just fair due to the extreme daytime heat, the dark skies allowed punching through to some objects that evade us from the city. There was always the opportunity to wander over to other scopes and see what others were tracking down. There was a full mix of Dobs big and small, refractors, binoculars big and small, and many serious astrophotographers. It became surprisingly cool the first three nights, but was pleasantly warm the last night, with better seeing.

Friday night was Public night for the residents of Big Valley, for which the area is aptly named, and it was a pleasure to

## TVS Bankhead Outreach



Image Caption: TVS hosted an outreach star party at the Bankhead Theater in Livermore. Participating club members included Rich, Eric, Roland, Ron, and Ross. This was a well attended event, as it was a warm night and people in the area stopped by and checked out views of Jupiter, Saturn, Alberio, and the Moon. Image Credit: K. Ross Gaunt

share the telescope views with the locals. Although I didn't win the main prize at the raffle, a first class Explore Scientific refractor, I nonetheless felt more than rewarded for the effort made to attend my first GSSP. It won't be the last.

## RTMC Star Party By Alan Gorski

This year's RTMC EXPO experienced a revival, with more attendees than I've seen in recent years. Of course, this year there was lots of interest in preparing for "America's Solar Eclipse" this August. In contrast to last year's Friday night talk and "show and tell," which attracted only a handful of attendees, this year it was a full house, with Dr. Fred Espanak (aka Mr. Eclipse) describing how to photograph a total solar eclipse, in addition to various topics of interest provided by members of the audience. Saturday, David Dunham, a world-famous lunar and asteroid occultation hunter, gave a talk on "Observing the Eclipse from the Edge," describing Bailey's Beads and the lunar profile during the eclipse.

There were more telescopes this year too, with Telescope Merit awards going to seven participants. The weather was great. The phase of the Moon was new, and coupled with fairly dark skies and good seeing I did imaging all four nights.

This year was a special year for me for a couple of reasons. Thirty-eight years ago, in 1979, I gave my first talk at RTMC on "Color Slide Enhancement of Aurora and Deep Sky Objects Using a Slide Duplicator." I'd given other talks at

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## Club Member Images: GSSP, RTMC, and Stellarvue Star Parties



Image Caption: (top-left) Roland Albers prepares for a night of viewing and imaging at the Golden State Star Party held in June near Aiden, CA. Image Credit: Rich Combs. (top-right) At the Riverside Telescope Making Conference Astronomy Expo, Alan Gorski took this two-minute image of the Rosette Nebula using a modified Canon full-frame DSLR at ISO 3200 through a TeleVue Nagler-Petzval 127mm, f/5.2 APO refractor, with a large format corrector and a Hutech V4 Nebular Filter. Long exposure noise reduction and maximum high ISO noise reduction were enabled, and color correction was set to Daylight. (bottom) Andy Coutant assembled this panoramic image of the Milky Way from images he took at the Stellarvue Deep-Sky Star Party held in Likely, CA.

RTMC through the years, but nothing for the last twenty. At last year's RTMC I decided I have waited long enough and it was time to do it again, this time talking about digital imaging with a modified Canon DSLR camera. Whereas most published images are multi-hour stacked exposures taken with cooled CCD imager through multiple color filters that are Photoshop'd, you can capture good color images in 2 minutes (at ISO 3200) with a modified DSLR. Images are enhanced (contrast, color saturation, brightness and cropped) with software that comes with most computers (JPEG Picture Fix). My 45-minute talk, "DSLR Imaging, Getting Started, What to Expect," was well received and perhaps inspired others to do the same.

Secrets of my success: If you have a modified Canon DSLR, three things you need to do. Using the menu, enable "Long Exposure Noise Reduction," and "High ISO Noise Reduction" to maximum. You'll also need some kind of Light Pollution Suppression Filter from Hutech (P2, V4) or Astronomiks (CLS).

Otherwise your images will be somewhat orange or brownish.

Astro Imaging: Every year for the last five years I've entered the Astro Imaging contest. I've gotten used to not winning anything, but I enjoy sharing my photos with others. This year was different, as my image of the Rosette Nebula in Monoceros received the prestigious Carmelita Miranda "Best of Show" award. The award comes with an impressive plaque which I display with pride.

Lastly, next year's 50th Anniversary RTMC EXPO should be even bigger with lots of shots of the solar eclipse. I hope to see more of you there.

### Stellarvue Deep-Sky Star Party By Andy Coutant

For the June New Moon I went to Likely Place Golf Resort in Likely, CA. This happened to be the same weekend as the

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

All times are Pacific Daylight Time

### July

- 13 Thu Venus 3 degrees north of Aldebaran
- 16 Sun **Last-Quarter Moon (12:26pm)**
- 20 Thu Crescent Moon about 3 degrees lower-right of Venus (dawn)
- 23 Sun **New Moon (2:46am)**
- 24 Mon Super-thin crescent Moon 5 degrees to the lower-right of Mercury, Regulus upper-left of Mercury (dusk)
- 27 Thu Delta Aquariid Meteor Shower peaks in the morning
- 28 Fri Crescent Moon is about 3 degrees to the upper-left of Jupiter, Spica 8 degrees to their left (dusk)
- 30 Sun **First-Quarter Moon (8:23am)**

### August

- 2 Wed Saturn located about 4 degrees to the lower-left of the Moon (evening)
- 7 Mon **Full Moon (11:11am)**
- 11-13 Fri- The Perseid Meteor shower peaks in the morning of the 12th, however the Moon rises before midnight
- 14 Mon **Last-Quarter Moon (6:15pm)**
- 16 Wed The crescent Moon about 2 degrees from Aldebaran (morning)
- 19 Sat The crescent Moon is about 5 degrees below Venus in the east (dawn)
- 21 Mon **New Moon (11:30am)/Total Solar Eclipse from the NW to the SE US!!!**
- 25 Fri Crescent Moon, Jupiter, and Spica form a triangle in the west (dusk)
- 29 Tue **First-Quarter Moon (1:13am)**
- 29-30 Tue- The Moon is about 7 degrees away from Saturn (evening)

### September

- 5 Tue Neptune at opposition, closest to Earth and brightest of the year, visible all night
- 6 Wed **Full Moon (00:03am)**
- 12 Tue Mercury at greatest elongation, 17.9 degrees from the Sun, visible in the east (predawn)

Stellarvue DSSP, so there were about 30-40 other scopes there, some good seminars and a lot of nice people.

The drive took 6.5 hours. The skies were very dark on 3 of the 4 nights, and I was told they measured  $22.5 \text{ mag}/(\text{arc sec})^2$ , so I can see why Tony Hallas has a permanent trailer there. The meadow where the telescope pads are located has great horizon views,  $360^\circ$ .

The golf resort link below shows the grounds and amenities. They have quite a few, so it made for a comfortable few days with telescope pads with power, flush toilets, free showers, tent camping, and RV hook-ups. There is an on-premises cafe

that is fully stocked (and pretty good). Wifi and cell service worked with Verizon, but was spotty for AT&T.

If you forget anything, Alturas, CA is 22 miles to the north. It is a small town, which cast no noticeable light dome, but is big enough to have a Rite-Aid and a few stores.

For more information, the resort website link is: <http://likely-place.com/#home/overview>

And here is a folder with a few pics from the grounds <https://goo.gl/photos/9VXpKzqvKqksg9GR9>

## The Shape of the Solar System

By Marcus Woo

When Stamatios (Tom) Krimigis was selected for the Voyager mission in 1971, he became the team's youngest principal investigator of an instrument, responsible for the Low Energy Charged Particles (LECP) instrument. It would measure the ions coursing around and between the planets, as well as those beyond. Little did he know, though, that more than 40 years later, both Voyager 1 and 2 still would be speeding through space, continuing to literally reshape our view of the solar system.



The solar system is enclosed in a vast bubble, carved out by the solar wind blowing against the gas of the interstellar medium. For more than half a century, scientists thought that as the sun moved through the galaxy, the interstellar medium would push back on the heliosphere, elongating the bubble and giving it a pointy, comet-like tail similar to the magnetospheres—bubbles formed by magnetic fields—surrounding Earth and most of the other planets

“We in the heliophysics community have lived with this picture for 55 years,” said Krimigis, of The Johns Hopkins University Applied Physics Laboratory in Laurel, Maryland. “And we did that because we didn’t have any data. It was all theory.”

But now, he and his colleagues have the data. New measurements from Voyager and the Cassini spacecraft suggest that the bubble isn’t pointy after all. It’s spherical.

Their analysis relies on measuring high-speed particles from the heliosphere boundary. There, the heated ions from the solar wind can strike neutral atoms coming from the interstellar medium and snatch away an electron. Those ions become neutral atoms, and ricochet back toward the sun and the planets, uninhibited by the interplanetary magnetic field.

Voyager is now at the edge of the heliosphere, where its LECP instrument can detect those solar-wind ions. The researchers found that the number of measured ions rise and fall with increased and decreased solar activity, matching the 11-year solar cycle, showing that the particles are indeed originating from the sun.

Meanwhile, Cassini, which launched 20 years after Voyager

in 1997, has been measuring those neutral atoms bouncing back, using another instrument led by Krimigis, the Magnetosphere Imaging Instrument (MIMI). Between 2003 and 2014, the number of measured atoms soared and dropped in the same way as the ions, revealing that the latter begat the former. The neutral atoms must therefore come from the edge of the heliosphere.

If the heliosphere were comet-shaped, atoms from the tail would take longer to arrive at MIMI than those from the head. But the measurements from MIMI, which can detect incoming atoms from all directions, were the same everywhere. This suggests the distance to the heliosphere is the same every which way. The heliosphere, then, must be round, upending most scientists’ prior assumptions.

It’s a discovery more than four decades in the making. As Cassini ends its mission this year, the Voyager spacecraft will continue blazing through interstellar space, their remarkable longevity having been essential for revealing the heliosphere’s shape.

“Without them,” Krimigis says, “we wouldn’t be able to do any of this.”

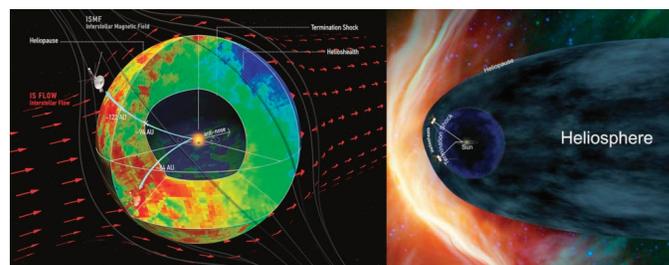


Image Caption: Caption: New data from NASA’s Cassini and Voyager show that the heliosphere — the bubble of the sun’s magnetic influence that surrounds the solar system — may be much more compact and rounded than previously thought. The image on the left shows a compact model of the heliosphere, supported by this latest data, while the image on the right shows an alternate model with an extended tail. The main difference is the new model’s lack of a trailing, comet-like tail on one side of the heliosphere. This tail is shown in the old model in light blue. Image credits: Dialynas, et al. (left); NASA (right)

To teach kids about the extreme conditions on Titan and other planets and moons, visit the NASA Space Place: <https://spaceplace.nasa.gov/planet-weather/>

This article is provided by NASA Space Place. With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology. Visit [spaceplace.nasa.gov](https://spaceplace.nasa.gov) to explore space and Earth science!



Tri-Valley Stargazers  
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Livermore, CA 94551  
[www.trivalleystargazers.org](http://www.trivalleystargazers.org)

## Tri-Valley Stargazers Membership Application

(or apply for membership online: [www.trivalleystargazers.org/membership.shtml](http://www.trivalleystargazers.org/membership.shtml))

### Contact information:

Name: \_\_\_\_\_ Phone: \_\_\_\_\_

Street Address: \_\_\_\_\_

City, State, Zip: \_\_\_\_\_

Email Address: \_\_\_\_\_

Status (select one): \_\_\_\_\_ New member \_\_\_\_\_ Renewing or returning member

**Membership category** (select one): Membership term is for one calendar year, January through December.

\_\_\_\_\_ Student member (\$5). Must be a full-time high-school or college student.

\_\_\_\_\_ Regular member (\$30).

\_\_\_\_\_ Patron member (\$100). Patron membership grants use of the club's 17.5" reflector at H2O. You must be a member in good standing for at least one year, hold a key to H2O, and receive board approval.

**Hidden Hill Observatory Access** (optional):

\_\_\_\_\_ One-time key deposit (\$20). This is a refundable deposit for a key to H2O. New key holders must first hear an orientation lecture and sign a usage agreement form before using the observing site.

\_\_\_\_\_ Annual access fee (\$10). You must also be a key holder to access the site.

**Magazine Subscriptions** (optional): Discounted subscriptions are available only to new subscribers. All subsequent renewals are handled directly with the magazine publishers.

\_\_\_\_\_ One-year subscription to Sky & Telescope magazine (\$32.95).

\_\_\_\_\_ One-year subscription to Astronomy magazine (\$34).

**Donation** (optional):

\_\_\_\_\_ Tax-deductible contribution to Tri-Valley Stargazers

**Total enclosed:** \$ \_\_\_\_\_

Member agrees to hold Tri-Valley Stargazers, and any cooperating organizations or landowners, harmless from all claims of liability for any injury or loss sustained at a TVS function. TVS will not share information with anyone other than other club members and the Astronomical League without your express permission.

Mail this completed form along with a check to: Tri-Valley Stargazers, P.O. Box 2476, Livermore, CA 94551.