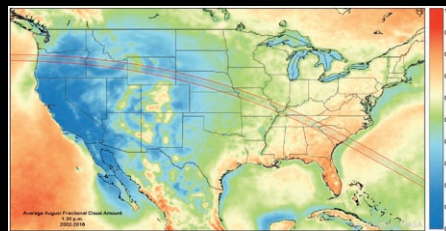


# PRIMEFOCUS

Tri-Valley Stargazers



February 2017



## Meeting Info

### What:

Sharing Our Love of Astronomy

### Who:

Vivian White

### When:

February 17, 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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## February Meeting

### Sharing Our Love of Astronomy

#### Vivian White

NASA recognizes how effective amateur astronomers are at sharing the wonder of space within their communities and, along with the Astronomical Society of the Pacific, formed the Night Sky Network to provide resources and support to astronomy clubs across the US. Find out about the ToolKits, handouts, and programs offered through this free program that now hosts over 400 astronomy clubs. Vivian will share information about this and other ASP programs dedicated to increasing science literacy through astronomy. She also brings updates on the latest eclipse plans and opportunities for August, including participation in the Google Megamovie.



Image Caption: Check out Vivian White's blog to learn more about her world travels to teach astronomical outreach: <https://myheadisinthestars.wordpress.com>

Vivian White is the Director of Free Choice Learning at the Astronomical Society of the Pacific, where she has been an astronomy educator for more than a decade. Her work takes her around the world and includes bringing astronomy to schools and museums as well as training amateur and professional astronomers in outreach. She has given talks to other clubs about teaching monks in India and how 70% of the world's large telescopes will be in Chile within a decade.

### Due are Due: Final Notice

Roland Albers reports that as of the end of January, we already have 65 renewals and new memberships for 2017. This is well ahead of last year's pace. But we also still have over 40 club members who have yet to renew. If you're one of the stragglers, please renew now so you don't miss out on club benefits, like newsletter notifications, Astronomical League membership, and access to H2O for keyholders. See p.2 for instructions on how to pay your dues online.

## 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
Feb. 17	Feb. 20	
Mar. 17	Mar. 20	Feb. 24
Apr. 21	Apr. 24	Mar. 31
May 19	May 22	Apr. 28
Jun. 16	Jun. 19	May 26
Jul. 21	Jul. 24	Jun. 30
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 1/23/17, our club's checking account balance is \$16,613.79. Our net cash flow for 2016 was +\$3,168.48, mostly thanks to increased membership and substantial sales of donated equipment. Anyone wishing a copy of the full Statement should contact Roland Albers.

### Dues are Due: Final Notice

TVS membership is open to anyone with an interest in astronomy. Amateurs and professionals are equally welcome; skilled amateurs comprise the majority of the membership. You do not have to own a telescope in order to be a member. The term of membership is one calendar year - January through December. Note: As an option, Patron Membership, which grants use of the club's 17.5" reflector at H2O, is available at the annual rate of \$100.00.

You can join TVS or renew your membership online at:

<http://www.trivalleystargazers.org/membership.shtml> After filling out the application form you are connected to the PayPal payment form. You do not need to have a PayPal account to pay online, since PayPal will accept credit cards. Everyone is encouraged to use the online application. Alternatively, you can mail in the Membership Application on the last page of this newsletter along with a check to the Tri-Valley Stargazers, P.O. Box 2476, Livermore, CA 94551-2476. Note that TVS will not share your information with anyone. We only use the e-mail address to notify you when the newsletter becomes available.

All members agree to hold the 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.

### Crescent Deja vu By Rich Combs

A few years back I was set up in downtown Pleasanton, showing passerby's a late-daytime view of a beautiful crescent Venus. The sun was blocked behind a building as it was heading down. As it began to get a little darker, one viewer said, "Oh that's a nice view of the Moon." I said that's not the Moon it's Venus! The viewer said, "But that's the Moon right there." I looked up from the scope, and sure enough about 10 degrees from Venus, coming out from behind another building, and becoming more obvious as the sky darkened, was the crescent Moon, an almost identical crescent as Venus. And I hadn't realized it was there! Of course I then switched to viewing one, then the other. Dramatic!

The same arrangement will occur this February 28th, a Tuesday. The crescent Moon will nestle just a few degrees away from a similar crescent Venus. If you are available, I'd like to set up two or three telescopes, and have a couple of additional stargazers available to answer questions, and perhaps do a Moon phases exercise. Location is not yet determined, but if the courtyard in front of the Bankhead Theater in Livermore is positioned well, we might go there. Mark the date, and let me know if you are interested.

### Outreach Star Parties: Request for Assistance

Eric Dueltgen is looking for volunteers to bring telescopes and/or binoculars to the following Outreach Star Parties:

Friday, March 3rd, 6:30 to 8:00pm: Emma Smith Elementary School, Livermore

Friday, March 31st, 6:30 to 8:00pm: Valley Christian Elementary, Dublin

### Daily

## Calendar of Events

What: A View to the Stars  
Who: Chabot Exhibit  
Where: Chabot Space and Science Center, 10000 Skyline Blvd., Oakland, CA 94619  
Cost: Chabot Admission \$18 Adults, \$14 Youth, \$15 Seniors, Free for Members

Chabot Space & Science Center - formerly Chabot Observatory, formerly Oakland Observatory - has put stars in the eyes of its citizens, students and visitors from around the world for over 130 years. IT ALL STARTED WITH THE GIFT OF A TELESCOPE to the city of Oakland in 1883 - only a few years after folks were traveling west in covered wagons.

Header Image: August 21, 2017 total solar eclipse path superimposed on early afternoon August cloud cover. The cloud data are based on 17 years of satellite data obtained from NASA Goddard Space Flight Center/R. Stockli. For more information see Jay Anderson's website: <http://eclipsophile.com/overview/>

## News & Notes (continued)

Since then, countless visitors have gazed through the Chabot telescopes at the WONDERS OF THE NIGHT SKY. Chabot Observatories: A View to the Stars explores the history of the Chabot Observatories and how its historic telescopes continue to be used today. Daytime visitors can operate a virtual telescope, experiment with mirrors and lenses to understand how telescopes create images of distant objects, and TRAVEL THROUGH MORE THAN A CENTURY of Chabot's history via multimedia kiosks, historical images and artifact displays.

See <http://www.chabotspace.org/exhibits.htm> for more information, or call (510) 336-7373.

### February 14, 12:00pm

**What:** Constraining the Evolution of a Delta Deposit on Mars from Orbit  
**Who:** Tim Goudge, UT Austin  
**Where:** SETI Institute Colloquium, Microsoft Silicon Valley Campus (Galileo Room), 1065 La Avenida St., Mountain View, CA  
**Cost:** Free

Decades of planetary exploration have revealed widespread evidence for ancient fluvial activity on the surface of Mars, including deeply incised valleys, paleolake basins, and an extensive sedimentary rock record. Acquisition of high-resolution remote sensing data of the martian surface (e.g., images and topography) over the past 5-10 years have allowed for quantitative analysis of the large-scale sedimentary structures of martian sedimentary deposits.

In this talk, Dr. Goudge will focus on a detailed study of the stratigraphic architecture and channel deposit geometries of the Jezero crater delta deposit on Mars. Results from this

study are used to reconstruct a scenario for the evolution of the Jezero crater delta and paleolake in which it formed. This delta deposit is a representative example of fluvial stratigraphy on early Mars, and these results can help to improve our understanding of ancient martian fluvial activity.

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

### February 15, 7:00pm

**What:** Beyond: Our Future in Space  
**Who:** Dr. Chris Impey, University of Arizona  
**Where:** Smithwick Theatre, 12345 El Monte Road, Los Altos Hills, CA 94022  
**Cost:** Free, \$3 parking (Credit Cards or \$1 dollar bills)

The talk will review the history and landmarks of the international space program, give a snapshot of the current situation, and plot the trajectory of the future of space travel. The early successes of the Space Age were driven by a fierce rivalry between the Soviet Union and the United States. Now, a vibrant private sector led by SpaceX and Virgin Galactic plans to launch supplies cheaply into Earth orbit and give anyone the chance of a sub-orbital joy ride. Permanent bases on the Moon and Mars are now within reach, and a new Space Race is brewing, with Asian countries ascendant.

For more information see: [www.foothill.edu/news/newsfmt.php?sr=2&rec\\_id=5005](http://www.foothill.edu/news/newsfmt.php?sr=2&rec_id=5005) or phone 650-949-7888.

### February 18, 6:00pm-10:00pm

**What:** Highly Mixological: A Star Trek Celebration  
**Who:** Chabot Exhibit  
**Where:** Chabot Space and Science Center, 10000 Skyline

continued on page 4

#### **Officers**

**President:**  
Rich Combs  
[president@trivalleystargazers.org](mailto:president@trivalleystargazers.org)  
**Vice-President:**  
Eric Dueltgen  
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**Treasurer:**  
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**Secretary:**  
Joy Milsom  
[secretary@trivalleystargazers.org](mailto:secretary@trivalleystargazers.org)

#### **Volunteer Positions**

**Astronomical League Representative:**  
Dennis Beckley  
[alrep@trivalleystargazers.org](mailto:alrep@trivalleystargazers.org)  
**Club Star Party Coordinator:**  
Eric Dueltgen  
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**Historian:**  
Hilary Jones  
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**Loaner Scope Manager:**  
Ron Kane  
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**Newsletter Editor:**  
Ken Sperber  
[newsletter@trivalleystargazers.org](mailto:newsletter@trivalleystargazers.org)  
925-361-7435

#### **Observatory Director/**

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**Outreach Coordinator:**  
Eric Dueltgen  
[outreach@trivalleystargazers.org](mailto:outreach@trivalleystargazers.org)  
**Potluck Coordinator:**  
Jill Evanko  
[potluck@trivalleystargazers.org](mailto:potluck@trivalleystargazers.org)  
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**Publicity Coordinator:**  
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**Refreshment Coordinator:**  
Laurie Grefsheim  
**Webmaster:**  
Hilary Jones  
[webmaster@trivalleystargazers.org](mailto:webmaster@trivalleystargazers.org)

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

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

## Calendar of Events (continued)

Blvd., Oakland, CA 94619

Cost: Chabot Admission \$18 Adults, \$14 Youth,  
\$15 Seniors, Free for Members

Get your last chance to experience our 50 Artists before the close of the exhibit on February 19th. Experiment with Star Trek- inspired cocktails, and experience a Theramin performance and try your hand at making space music. Learn about the possibility of life on other planets from Berkeley SETI Research Center Chief Scientist and Trekkie Dan Werthimer or let Thomas Marrone, the lead artist for the starship and user interface art teams at Star Trek Online, explore why the Starship Enterprise is iconic. Capture a memorable evening dressed in our Star Trek costumes at the spacey photo booth, play Spock games, and gaze into the universe and learn about constellations in our sci-fi planetarium show. Come dressed in your most impressive Star Trek- inspired attire and enter to win our costume contest! Or you could always wear a red shirt. This event is 21+.

See <http://www.chabotspace.org/exhibits.htm> for more information, or call (510) 336-7373.

### February 21, 12:00pm

What: Origins of Structure in Planetary Systems  
Who: Ruth Murray-Clay, UC Santa Cruz  
Where: SETI Institute Colloquium, Microsoft Silicon Valley Campus (Galileo Room), 1065 La Avenida St., Mountain View, CA  
Cost: Free

No details 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.

### March 6, 7:30pm

What: Mapping the Heavens  
Who: Priyamvada Natarajan, Yale University  
Where: California Academy of Science, 55 Music Course 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.

In this talk, Dr. Natarajan discusses how our cosmic view has been transformed by two radical ideas in cosmology - dark matter and black holes. She will present the history of how we discovered these invisible entities, as well as recent leaps in our understanding of them, from mapping dark matter to the discovery of gravitational waves emitted by colliding black holes.

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

### March 7, 12:00pm

What: Search for Extrasolar Moons and Rings Using Transit Observations  
Who: Paul Kala, UC Berkeley  
Where: SETI Institute Colloquium, Microsoft Silicon Valley Campus (Galileo Room), 1065 La Avenida St., Mountain View, CA  
Cost: Free

No details 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.

### March 14, 12:00pm

What: A Journey to Alpha Centauri  
Who: Christian Marois, University of Victoria  
Where: SETI Institute Colloquium, Microsoft Silicon Valley Campus (Galileo Room), 1065 La Avenida St., Mountain View, CA  
Cost: Free

The Alpha Centauri star system is ideal to search for habitable planets by various observing techniques due to its proximity and wide range of stellar masses. Following the recent discovery of an Earth-size planet candidate located inside the Proxima Centauri habitable zone, Dr. Marois will discuss this remarkable discovery and the planet's potential to find life. He will also present our current instrument project for the Gemini South observatory, TIKI, to discover similar planets around the two Sun-like pair located 15,000 AU from Proxima Centauri. The Alpha Centauri system is the prime target of the Breakthrough Starshot program, a project to send small quarter-size probes to take resolve images of these new worlds, and to prepare for Humanity's first step into a new star system.

Dr. Marois completed his Ph.D. at the Université de Montréal in 2004. The main topic of his thesis work was to understand the limits in exoplanet imaging and to design innovating observing strategies. After his thesis, he did postdoctoral researches at the Lawrence Livermore National Laboratory, Univ. of California Berkeley and NRC. In 2008, while at NRC, he led the team that took the first image of another planetary system (HR 8799) using the Keck and Gemini telescopes. He is currently pursuing his research at the NRC Herzberg where he is part of the Gemini Planet Imager campaign, and leading the development of instruments for imaging Earth-like planets at Gemini South and at the TMT.

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



## Member Astrophotos



Image Caption: Roland Albers took this "first light" image of the open clusters M35 (center) and NGC2158 (lower-right) from his backyard in Pleasanton. The cropped field of view is approximately  $1.3^\circ \times 0.9^\circ$ . Roland used his new Stellarvue 80mm refractor, a Christmas gift from his wife, and his Canon T5i DSLR to obtain the image. This image is the result of combining 25 2-minute exposures at 800 ISO, along with dark and flat frames. He processed the data using DeepSkyStacker and PhotoShop. M35 is about 2800 light years distant, while NGC2158 is about 11,000 light years distant.

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

All times are Pacific Standard Time until Pacific Daylight Time begins on Sunday, March 12 at 2am.

### February

- 10 Fri Full Moon (4:33pm)
- 10-11 Fri The Moon and Regulus move closer throughout the night
- 15 Wed The waning gibbous Moon, Jupiter, and Spica form an arc 6-8 degrees long (Morning)
- 18 Sat Last-Quarter Moon (11:33am)
- 19 Sun Algol at minimum brightness for 2 hours centered at 6:50pm
- 20 Mon The waning crescent Moon rises at about 2am, with Saturn rising about 1 hour later
- 22 Wed Algol at minimum brightness for 2 hours centered at 6:39pm
- 26 Sun New Moon (6:58am)
- 28 Tue Venus and the crescent Moon a few degrees apart. Join Rich Combs in downtown Livermore to show this spectacle to the public (see the article on p. 2 of this newsletter)

### March

- 1 Wed Mars 5 degrees right of the crescent Moon, Venus about 15 degrees to the lower-right (Evening)
- 4 Sat The Moon occults Aldebaran (Disappears 7:02pm, Reappears 8:16pm; see S&T, March, p. 48)
- 5 Sun First-Quarter Moon (3:32am)
- 10 Fri The Moon is about 3 degrees below Regulus
- 12 Sun Daylight Savings Time begins (2am)
- 12 Sun Full Moon (7:54am)
- 14 Tue Algol at minimum brightness for 2 hours centered at 9:24pm
- 20 Mon Saturn about 3 degrees away from the last-quarter Moon
- 20 Mon Last-Quarter Moon; Saturn about 3 degrees away (8:58am)
- 27 Mon New Moon (7:57pm)
- 29 Wed Mars about 1.5 degrees above the thin crescent Moon (30-45 minutes after sunset)

## Comet Campaign: Amateurs Wanted

By Marcus Woo

In a cosmic coincidence, three comets will soon be approaching Earth—and astronomers want you to help study them. This global campaign, which will begin at the end of January when the first comet is bright enough, will enlist amateur astronomers to help researchers continuously monitor how the comets change over time and, ultimately, learn what these ancient ice chunks reveal about the origins of the solar system.



Over the last few years, spacecraft like NASA's Deep Impact/EPOXI or ESA's Rosetta (of which NASA played a part) discovered that comets are more dynamic than anyone realized. The missions found that dust and gas burst from a comet's nucleus every few days or weeks—fleeting phenomena that would have gone unnoticed if it weren't for the constant and nearby observations. But space missions are expensive, so for three upcoming cometary visits, researchers are instead recruiting the combined efforts of telescopes from around the world.

"This is a way that we hope can get the same sorts of observations: by harnessing the power of the masses from various amateurs," says Matthew Knight, an astronomer at the University of Maryland.

By observing the gas and dust in the coma (the comet's atmosphere of gas and dust), and tracking outbursts, amateurs will help professional researchers measure the properties of the comet's nucleus, such as its composition, rotation speed, and how well it holds together.

The observations may also help NASA scout out future destinations. The three targets are so-called Jupiter family comets, with relatively short periods just over five years—and orbits that are accessible to spacecraft. "The better understood a comet is," Knight says, "the better NASA can plan for a mission and figure out what the environment is going to be like, and what specifications the spacecraft will need to ensure that it will be successful."

The first comet to arrive is 41P/Tuttle-Giacobini-Kresak, whose prime window runs from the end of January to the end of July. Comet 45P/Honda-Mrkos-Pajdusakova will be most visible between mid-February and mid-March. The third target, comet 46P/Wirtanen won't arrive until 2018.

Still, the opportunity to observe three relatively bright comets within roughly 18 months is rare. "We're talking 20 or more years since we've had anything remotely resembling this," Knight says. "Telescope technology and our knowledge of comets are just totally different now than the last time any of these were good for observing."

For more information about how to participate in the campaign, visit <http://www.psi.edu/41P45P46P>.

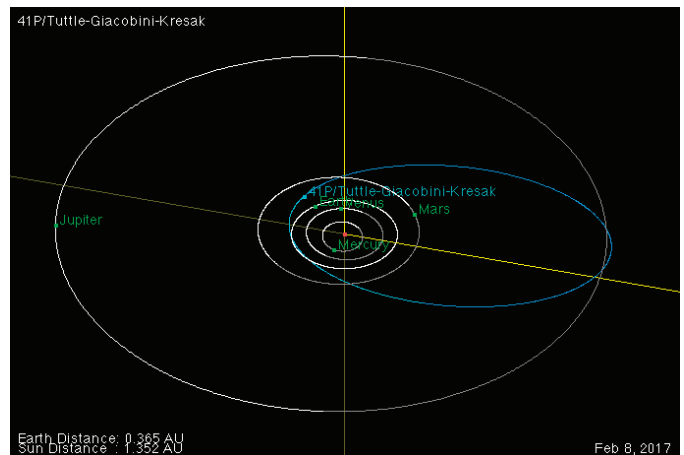


Image Credit: An orbit diagram of comet 41P/Tuttle-Giacobini-Kresak on February 8, 2017—a day that falls during the comet's prime visibility window. The planets orbits are white curves and the comet's orbit is a blue curve. The brighter lines indicate the portion of the orbit that is above the ecliptic plane defined by Earth's orbital plane and the darker portions are below the ecliptic plane. This image was created with the Orbit Viewer applet, provided by the Osamu Ajiki (AstroArts) and modified by Ron Baalke (Solar System Dynamics group, JPL). <http://ssd.jpl.nasa.gov/sbdb.cgi?orb=1;sstr=41P>

Want to teach kids about the anatomy of a comet? Go to the NASA Space Place and use Comet on a Stick activity! <http://spaceplace.nasa.gov/comet-stick/>

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](http://spaceplace.nasa.gov) to explore space and Earth science!



Tri-Valley Stargazers  
P. O. Box 2476  
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.