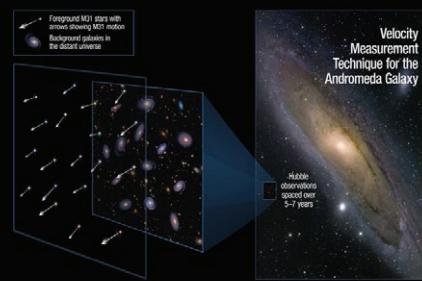


# PRIMEFOCUS

Tri-Valley Stargazers



June 2012



## Meeting Info

### What:

Part 1: Summer BBQ

Part 2: Deep-Sky Observing and Imaging with a Video Camera

### Who:

Dr. Curtis Macchioni

### When:

June 15, 2012

Set-up at 6:30 p.m.

Dinner at 7:00 p.m.

### Where:

Unitarian Universalist Church in Livermore  
1893 N. Vasco Road

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## June Meeting

### Dinner and a Show

Our June meeting will be our annual Summer BBQ. Plan on working up an appetite by helping to set-up and get the charcoal going at about 6:30pm. We will start eating around 7:00pm.

TVS will provide the burgers, condiments, drinks, and plastic ware. Members are asked to bring a side dish, salad, or dessert to share. Please bring enough to feed about 5-8 people.

Please bring family, friends, and future TVS members to share in the festivities.



### Deep-Sky Observing and Imaging with a Video Camera

#### Dr. Curtis Macchioni

Sony introduced the first camcorder in 1983, opening up a whole new realm of possibilities for amateur astronomy. A bit bulky and clunky, the camcorder provided the opportunity to capture video images of the sun, the moon, planets and more. The QuickCam, the first commercially available webcam, became available in 1994 with the ability to capture 60fps with a 320 x 240 pixel sensor. It wasn't long before amateur astronomers were turning webcams skyward to shoot 1,000s of frames of their favorite solar system object in the hopes of capturing and stacking a few hundred of the best images obtained during those brief moments of good seeing. Searching for more and better, amateurs began using video security cameras to capture longer exposure images through frame integration within the camera itself. This made it possible to capture reasonably good images of deep sky objects, previously only available with a traditional CCD camera. These days, video cameras specially designed for video astronomy are widely available. We will look at the different video cameras available today, discuss what one can expect to see using them for "live viewing" or public outreach, and see examples of deep sky imaging possibilities with them.

Curtis graduated from Carnegie Mellon University with a Ph.D. in Solid State Physics. He has worked for several different start-ups and defense contractors, but has spent most of his career in the computer disk drive industry. For the last 7 years, he has been employed with Western Digital Corp., the world's largest disk drive manufacturer, developing state-of-the-art technology which allows us to store our copious astro-images. He got back into astronomy in 2008 and started playing with a MallinCam video camera in late 2010.

## 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
Jun. 15	Jun. 18	
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

### TVS Club Survey

The board has spent the last couple of months developing an online member survey ([www.surveymonkey.com/s/J38ZB6J](http://www.surveymonkey.com/s/J38ZB6J)). The objective of the survey is to gather candid member input and make a genuine effort to improve the club experience for all members. Topics covered in the survey vary from the types of program topics we cover, to the structure of the monthly meetings, to the types of activities the club organizes outside of the regular monthly meetings. The board takes the survey and feedback from the membership very seriously, and will carefully review and report on the results.

### Welcome the new TVS Vice-President

Todd Billeci, who is also the TVS Program Director, has agreed to take on the role of TVS Vice-President.

### Star Party Requests/Participation

July 19th, Pleasanton Library: Dr. Kevin Manning presenting Astronomy for Everyone: Size & Scale of the Universe. His talk will be from approximately 7:00 to 9:00, after which he will invite people to look through his telescope on the front lawn. He welcomes any TVS members who want to bring their scopes too. For more information, contact Wayne Miller, TVS Star Party Coordinator.

July 29-30, Yosemite Star Party: We will be doing our annual Yosemite outing. In exchange for free admission to the Park and free camping Friday and Saturday nights at Bridal Veil Campground (with reserved spaces!), we provide the use of our telescopes for typically 150-200 people to use at the star parties, which are scheduled for Friday and Saturday night. For more information, contact Bob McKoon ([rmckoon@yahoo.com](mailto:rmckoon@yahoo.com))

August 14, Oregon Star Party: If you want more information, contact Todd Billeci, TVS Vice-President and Program Director. Todd says that he would be happy to organize a caravan.

## Journal Club by Ken Sperber

### Cosmic Smash-up

I think we all have heard that the Andromeda Galaxy (M31) will collide with the Milky Way in the distant future. It has been known for many years that M31 is located about 2.5 million light years away from us, and that it is moving toward us at about 250,000 miles per hour. The distance to M31 was derived from observing "standard candles," namely Cepheid Variables, as pioneered by Edwin Hubble. The velocity of M31 along our line of sight was determined using Doppler effect that indicated M31 starlight is blue-shifted. What has been unknown until now is whether the collision will be head-on, a glancing blow, or a gentle duet at best.

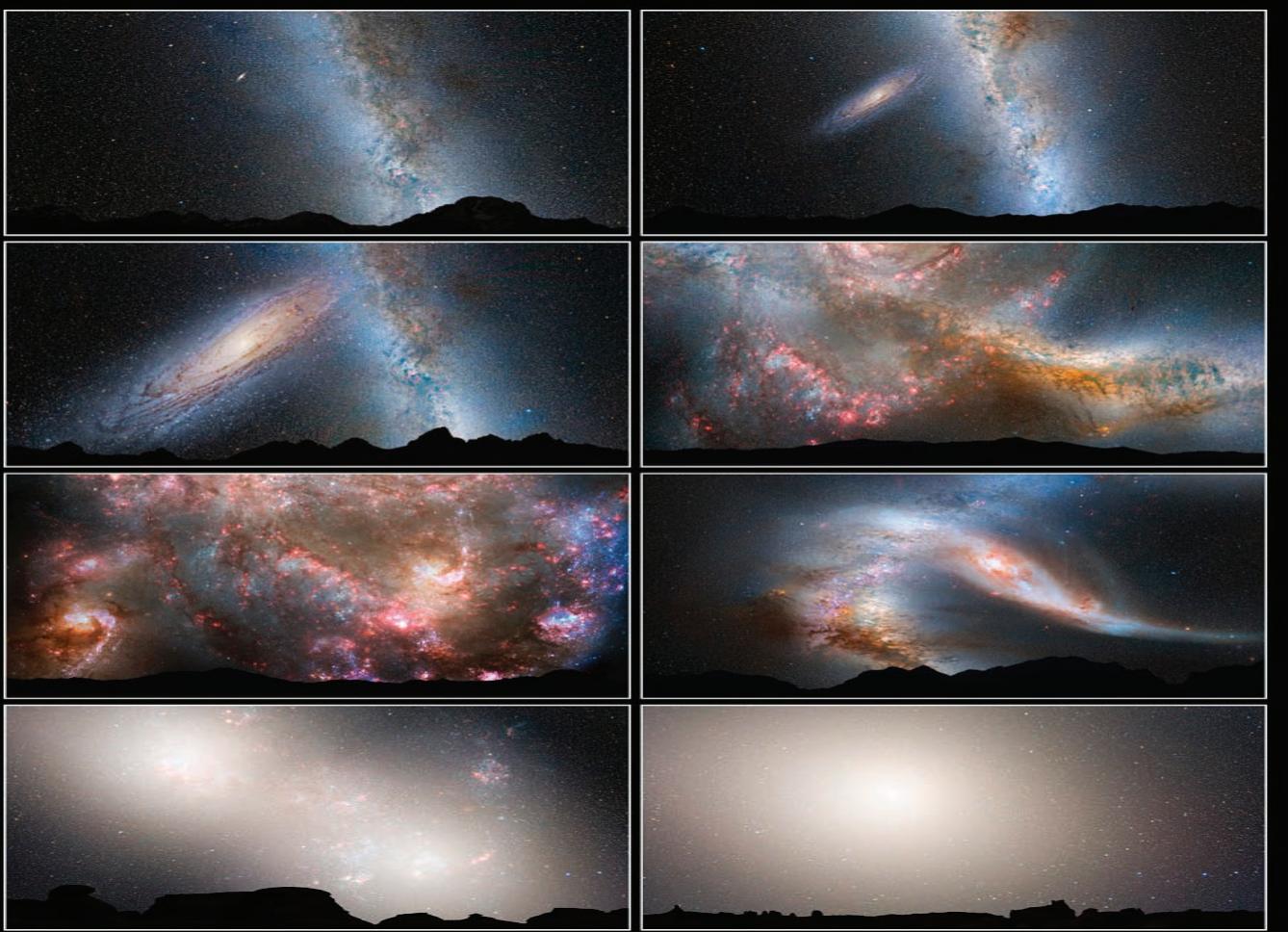
In three papers that will appear in a future issue of the *Astrophysical Journal*, NASA scientists have made critical observations of M31's lateral motion. Measurement of this side-ways motion was not possible until the recent upgrades of the Hubble Space Telescope. The estimate of the lateral motion "...was accomplished by repeatedly observing select regions of the galaxy over a five- to seven-year period," said Jay Anderson of Space Telescope Science Institute (STScI). These observations showed the side-ways motion of M31 stars relative to distant background galaxies (see the schematic header image on page 1). According to Roeland van der Marel of the STScI, "Our findings are statistically consistent with a head-on collision between the Andromeda galaxy and our Milky Way galaxy." "In the 'worst-case-scenario' simulation, M31 slams into the Milky Way head-on and the stars are all scattered into different orbits," said team member Gurtina Besla of Columbia University. "The stellar populations of both galaxies are jostled, and the Milky Way loses its flattened pancake shape with most of the stars on nearly circular orbits. The galaxies' cores merge, and the stars settle into randomized orbits to create an elliptical-shaped galaxy." These results are consistent with the paradigm of hierarchical galactic growth and evolution.

Some of the authors have generated illustrations of what our night-sky might look like at various stages of the collision and merger (see the page 3). Former TVS member Axel Mellinger provided the authors with a high-resolution version of his famous Milky Way panorama (<http://home.arcor-online.de/~axel.mellinger/>) to make the depiction as realistic as possible.

For more information see: <http://hubblesite.org/newscenter/archive/releases/2012/20/text/>, [http://www.nasa.gov/mission\\_pages/hubble/science/milky-way-collide.html](http://www.nasa.gov/mission_pages/hubble/science/milky-way-collide.html), and <http://www.universetoday.com/95557/its-inevitable-milky-way-andromeda-galaxy-heading-for-collision/>

**Header Image:** This illustration shows one of the regions in the neighboring Andromeda galaxy where astronomers aimed the Hubble Space Telescope to make precise measurements of the galaxy's lateral motion. As the galaxy drifts through space, the stars will appear to uniformly move against the far-more-distant background galaxies, which remain fixed on the sky. Credit: NASA, ESA, and A. Feild and R. van der Marel (STScI)

## Journal Club (continued)



Caption: This series of photo illustrations shows the predicted merger between our Milky Way galaxy and the neighboring Andromeda galaxy. First Row: Present Day (left), 2 Billion years from now (right); Second Row: 3.75 Billion years from now (left), 3.85 Billion years from now (right); Third Row: 3.9 Billion years from now (left), 4 Billion years from now (right); Fourth Row: 5.1 Billion years from now (left), 7 Billion years from now (right). Credit: NASA; ESA; Z. Levay and R. van der Marel, STScI; T. Hallas, and A. Mellinger

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### Eyes on the Skies

Eyes on the Skies is a robotic solar telescope run by Mike Rushford ([rushford@eyes-on-the-skies.org](mailto:rushford@eyes-on-the-skies.org)). You may access it by visiting [www.eyes-on-the-skies.org](http://www.eyes-on-the-skies.org).

### TVS E-Group

So how do you join the TVS e-group, you ask? Just send an e-mail message to the TVS e-mail address ([trivalleystargazers@gmail.com](mailto:trivalleystargazers@gmail.com)) asking to join the group. Make sure you specify the e-mail address you want to use to read and post to the group.

## Calendar of Events (continued)

### 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 Coloma/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.

### June 20, Noon-1:00pm

What: Fast molecular adaptations to environmental fluctuations - a recipe for long-term survival of life in the extremes  
Who: Oana Marcu, SETI Institute  
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA  
Cost: Free

A limiting factor for the survival of life in a changing environment is the intracellular production of reactive oxygen species. These can damage the building blocks of life (DNA, proteins, lipids) through oxidation. All organisms, including microbial extremophiles, have developed mechanisms to quench the reactivity of oxygen species or avoid their production. Not surprisingly, these same molecules are drivers for evolution. This talk will discuss the problem of oxygen toxicity, the solutions that life evolved, and will highlight lessons from the synchrotron in understanding the importance of intracellular oxidation for space biology and astrobiology.

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

### June 23, 8:30pm

What: The Milky Way as a Dark Matter Laboratory  
Who: Dr. Michael Kuhlen, UC Berkeley/Theoretical Astrophysics Center - Co-sponsored by Wonderfest

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

Over the next decade, a combination of astronomical observations and particle physics experiments hold great promise to finally shed light on the nature of dark matter.

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

### June 27, Noon-1:00pm

What: The Origins of Chondrules and Chondrites  
Who: Derek Sears, Bay Area Research Institute and NASA Ames Research Center  
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA  
Cost: Free

It is clear that the chondritic meteorites - those having essentially solar composition - carry unique information about the origin and early history of the solar system and the materials from which the planets formed. Yet it is a highly complex record that centuries of work and highly sophisticated modern techniques have not been able to decipher. Even the most fundamental issues, the origin of the chondrite classes and the origin of the chondrules that distinguish the meteorites from other materials, are still disputed.

Dr. Sears will argue that recent data from spacecraft on the nature of asteroid surfaces, advances in determining the chronology meteorites and their components, experiments flown on NASA's microgravity facility (the vomit comet), and the lunar samples returned from the Fra Mauro region of the Moon, make it clear that chondrules are impact melt spherules and the classes are caused by metal-silicate fractionation on asteroidal surfaces. In other words, the chondritic meteorites owe their major properties to asteroidal processes and that we must see through these to understand the information they carry about the early solar system and beyond.

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

### June 29, 6:00pm

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

## Calendar of Events (continued)

sions 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>

### July 9, 7:30pm

What: The Mars Science Laboratory Mission  
Who: Dr. David Blake, Exobiology Branch, NASA Ames Research Center  
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

The past 15 years of Mars exploration - by landers, rovers and orbiting spacecraft - have yielded a treasure trove of knowledge about the Red Planet. Each successive mission has carried with it a more capable, refined and nuanced science payload, building on the discoveries of its predecessors. The Mars Science Laboratory rover Curiosity is currently en route to Mars, to arrive at Gale Crater on Aug. 5th, 2012. Curiosity is the most sophisticated and capable rover yet and it will provide us with new knowledge of Mars' present climate and geology, and clues to its early habitability.

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

### July 11, Noon-1:00pm

What: The Kepler Mission: Zeroing in on Habitable Earths  
Who: Doug Caldwell, SETI Institute  
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA  
Cost: Free

Doug Caldwell is a SETI Astronomer and the Instrument Scientist for the Kepler Mission based at NASA Ames. Dr. Caldwell will give the status of the Kepler instrument and operation, a summary of exoplanet results of the Kepler Mission to date.

Kepler was launched in 2009 and is currently in an Earth trailing orbit. It detects exoplanets by looking for small but regular decreases in the brightness of stars.

On April 4, NASA awarded the Kepler team funding for an extended mission to carry the spacecraft through to 2016. Dr. Caldwell will address how the extended mission will work and what we might expect Kepler to detect in the next four years.

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

### June

- 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

### July

- 1-7 Sun- The Pleiades, Jupiter, Venus, and Aldebaran form a straight line low in the east (1 hour before dawn)  
3 Tue **Full Moon (11:52am)**  
4 Wed Earth at its farthest distance from the Sun (aphelion) (8pm)  
8-10 Sun- Aldebaran 1 degree right or lower-right from Venus (Pre-dawn)  
10 Tue **Last-Quarter Moon (6:48pm)**  
14 Sat Crescent Moon below Pleiades and above Jupiter (Pre-dawn)  
15 Sun Crescent Moon, Venus, Jupiter, and Aldebaran form a quadrangle (Pre-dawn)  
18 Wed **New Moon (9:24pm)**  
21 Sat Io's shadow falls on Jupiter's eastern limb at 2:51am, just before Europa's shadow leaves Jupiter's western limb.  
Europa southwest of Io's shadow  
24 Tue Crescent Moon, Saturn, Spica, and Mars form a quadrangle (Evening)  
26 Thu **First-Quarter Moon (1:56am)**  
28 Sat Io and Europa cast their shadows on Jupiter from 4:45 to 5:33am

## Thank Goodness for Magnetism

By Dr. Tony Phillips

Only 93 million miles from Earth, a certain G-type star is beginning to act up.

Every 11 years or so, the solar cycle brings a period of high solar activity. Giant islands of magnetism—"sunspots"—break through the stellar surface in increasing numbers. Sometimes they erupt like a billion atomic bombs going off at once, producing intense flares of X-rays and UV radiation, and hurling massive clouds of plasma toward Earth.

This is happening right now. Only a few years ago the Sun was in a state of deep quiet, but as 2012 unfolds, the pendulum is swinging. Strong flares are becoming commonplace as sunspots once again pepper the solar disk. Fortunately, Earth is defended from solar storms by a strong, global magnetic field.

In March 2012, those defenses were tested.

At the very beginning of the month, a remarkable sunspot appeared on the Sun's eastern limb. AR1429, as experts called it, was an angry-looking region almost as wide as the planet Jupiter. Almost as soon as it appeared, it began to erupt. During the period March 2nd to 15th, it rotated across the solar disk and fired off more than 50 flares. Three of those eruptions were X-class flares, the most powerful kind.

As the eruptions continued almost non-stop, Earth's magnetic field was buffeted by coronal mass ejections or "CMEs." One of those clouds hit Earth's magnetosphere so hard, our planet's magnetic field was sharply compressed, leaving geosynchronous satellites on the outside looking in. For a while, the spacecraft were directly exposed to solar wind plasma.

Charged particles propelled by the blasts swirled around

Earth, producing the strongest radiation storm in almost 10 years. When those particles rained down on the upper atmosphere, they dumped enough energy in three days alone (March 7-10) to power every residence in New York City for two years. Bright auroras circled both poles, and Northern Lights spilled across the Canadian border into the lower 48 states. Luminous sheets of red and green were sighted as far south as Nebraska.

When all was said and done, the defenses held—no harm done.

This wasn't the strongest solar storm in recorded history—not by a long shot. That distinction goes to the Carrington Event of September 1859 when geomagnetic activity set telegraph offices on fire and sparked auroras over Mexico, Florida, and Tahiti. Even with that in mind, however, March 2012 was remarkable

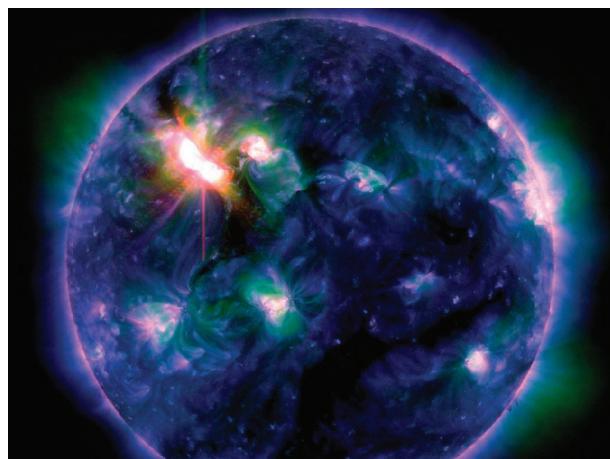
It makes you wonder, what if? What if Earth didn't have a magnetic field to fend off CMEs and deflect the most energetic particles from the Sun.

The answer might lie on Mars. The red planet has no global magnetic field and as a result its atmosphere has been stripped away over time by CMEs and other gusts of solar wind. At least that's what many researchers believe. Today, Mars is a desiccated and apparently lifeless wasteland.

Only 93 million miles from Earth, a G-type star is acting up. Thank goodness for magnetism.

With your inner and outer children, read, watch, and listen in to "Super Star Meets the Plucky Planet," a rhyming and animated conversation between the Sun and Earth, at <http://spaceplace.nasa.gov/story-superstar>.

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



Caption: Multiple-wavelength view of X5.4 solar flare on March 6, captured by the Solar Dynamics Observatory (SDO) in multiple wavelengths (94, 193, 335 angstroms). Credit: NASA/SDO/AIA

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.