

# PRIME FOCUS

Tri-Valley Stargazers

November 2008



## Meeting Info:

### What

*The Birth of Star Clusters*

### Who

Dr. Steven Stahler

### When

November 21, 2008  
Doors open 7:00 p.m.  
Lecture at 7:30 p.m.

### Where

Unitarian Universalist  
Church in Livermore  
1893 N. Vasco Road

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Dr. Steven Stahler

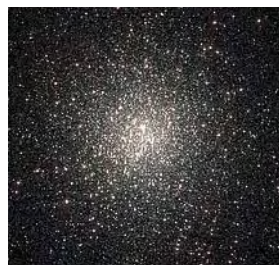
## November Meeting

### The Birth of Star Clusters

*Dr. Steven Stahler*

Stars are forming all around us, all the time. While a few are clumped into well-known groups, the vast majority seem to be randomly scattered throughout space. However, we have discovered that all stars are in fact born into compact groups. These primordial clusters can only be seen with the aid of infrared telescopes. Once stars become visible, most are in

T or OB associations, which disperse in a few million years. A small fraction are in open clusters, which survive for a much longer time. I suggest a unifying theory for this observed evolutionary picture. Finally, I draw the connection to globular clusters, the most ancient and populous of all stellar groups.



NGC 2808 in Carina is one of the largest globulars orbiting our galaxy, with over one million stars in the cluster. It's about 30,000 light years away.

*Photo: NASA, ESA, A. Sarajedini (University of Florida) and G. Piotto (University of Padua [Padova])*



M45 - The Pleiades star cluster is about 440 light years away in the constellation Taurus. There are about 1,000 stars in this cluster.

This color-composite image was taken by the Palomar 48-inch Schmidt telescope as part of the Digitized Sky Survey. It was made from three separate images taken in red, green, and blue filters, between November 5, 1986 and September 11, 1996. *Photo: NASA, ESA and AURA/Caltech*

## News & Notes

### 2008-2009 TVS Meeting Dates

The following lists the TVS meeting dates for the rest of the year, and the start of next year. The lecture meetings continue to be on the third Friday of the month, with the Board meetings on the Monday following the lecture meeting. The *Prime Focus* deadline applies to that month's issue (e.g., the December 19th deadline is for the December issue).

Lecture Meeting	Board Meeting	Prime Focus Deadline
Nov. 21	Nov. 24	Nov. 9
Dec. 19	Dec. 22	Dec. 7
Jan. 16	Jan. 19	Jan. 4

### Money Matters

Treasurer David Feindel was absent from the October board meeting. However, he later sent out a report to the board with the TVS account balances as of October 20, 2008. He also sent the proposed 2009 budget.

Checking	\$3,869.58	
CD #1	\$3,740.30	matures 11/17/08
CD #2	\$2,639.10	matures 11/27/08

### TVS Elections

Yes, it's finally time for the annual TVS elections. We will be voting for club officer and board of directors positions at the start of the November lecture meeting.

We really need more members to volunteer for the many officer and volunteer positions. Any member can run for any office or to be on the board; you don't have to have experience, just a desire to help the club.

All the positions (Officer & Board) require attendance at the majority of the board meetings. The meetings take place at the Round Table Pizza on E. Stanley Blvd in Livermore on the Monday after the general meeting. Meetings usually last one to two hours.

The **President** conducts the lecture and board meetings, and is responsible for getting everything done (usually by delegating it to others).

The **Vice-President** fills in when the President isn't available.

The **Treasurer** maintains the records of the club's checking and CD accounts, financial assets and liabilities, and transactions. S/he pays the bills and deposits any monies coming in (primarily from membership dues), and prepares a monthly report for the board meetings.

The Treasurer also sends in member subscriptions for *Sky & Telescope* and *Astronomy* magazines, functions as the Membership Chairperson, maintains the membership data base, sends membership updates to the newsletter editor,

and sends out e-mail notification when the newsletter is posted on line.

The Treasurer also picks up the mail from the club's PO box in Livermore, sends quarterly updates of our membership roster to the Astronomical League (for Reflector Magazine mailings), and orders and sells the RASC Handbooks and Calendars.

Attendance at general and board meetings is a high priority. The Treasurer position is one of the most time consuming positions. Our outgoing Treasurer will help with the transition and give instructions to whomever takes on this important position.

The **Secretary** writes up the minutes from the monthly board meetings, handles a limited amount of correspondence related to board activities, and acts as the liaison with the Unitarian Church. Attendance at the Board Meetings is necessary (hard to take meeting notes if you're not there). The amount of time required, in addition to attendance at the board meetings, is one to two hours per month.

The **Board of Directors** sit around and eat pizza at the board meeting. Along with the officers, they discuss club related business and make decisions regarding the future of the club.

There are several volunteer positions that need to be filled as well.

The **Program Director** is in charge of finding speakers for the monthly meetings. We need 10 speakers a year (the other two months of the year are our potluck dinners).

The **Hospitality** position requires bringing the refreshments to the meeting, making coffee and tea, and coordinating the summer and holiday potlucks.

The **Publicity** position involves contacting local newspapers regarding club activities and meetings. S/he would also arrange to have flyers available at our public outreach events.

The **Newsletter Editor** is responsible for creating the monthly newsletter (finding material, writing material, laying out said material, sending it off to the printer, and mailing the final product). It's probably the most time intensive out of all the jobs. Estimate 8-10 hours a month (usually crammed into four or five days).

*continued page 4*

#### Newsletter header image: NGC3324

This nebula is a star forming region in the constellation of Carina, 7,200 light years away.

The image is a composite of separate exposures made by the ACS and SFPC2 cameras on Hubble, two hours total exposure time. *Photo: NASA, ESA, and the Hubble Heritage Team (STScI/AURA)*

## Calendar of Events

### December 15, 7:30 p.m.

**What:** *The Messenger Mission to Mercury*  
**Who:** Robert Gold (Applied Physics Laboratory, John Hopkins Univ.)  
**Where:** Kanbar Hall, Jewish Community Center of S.F.  
**Cost:** \$5 in advance by mail or at the door

The Messenger spacecraft is on its way to orbit Mercury, a planet of extremes. Mercury has the greatest temperature variation, the highest density, and the most Earth-like magnetosphere of any planet. Despite Mercury often being the closest planet to Earth, very little was known about it because it is very difficult to observe and study. It has taken 30 years to mount an orbital mission to this terrestrial planet. Messenger has already flown by the planet twice. It has revealed exciting new information about Mercury's structure and the geological processes that have shaped it. This lecture will cover the challenges of developing a spacecraft to deal with the extreme environment at Mercury and show some of the amazing scientific results from the Messenger flybys.

All programs begin at 7:30 pm in Kanbar Hall at the Jewish Community Center of San Francisco, 3200 California Street (at Presidio Avenue). Please e-mail any questions to [deanseries@calacademy.org](mailto:deanseries@calacademy.org) or call 415-379-8000. Tickets are available online at [www.calacademy.org/events/index.php](http://www.calacademy.org/events/index.php) or at the door.

Parking is available across the street in the UCSF Laurel Heights campus parking lot or in the JCCSF garage. The #1 California, #3 Jackson, #4 Sutter, and #43 Masonic MUNI lines stop directly in front of the building. The #38 Geary and #24 Divisadero stop four to five blocks away.

### December 31, 12:45 p.m. and 3:45 p.m.

**What:** *New Year's Eve Balloon Drop*  
**Who:** Everyone  
**Where:** Chabot Space & Science Center  
**Cost:** Chabot Members: \$3 per child;  
Non-Members: \$3 per child plus admission to Chabot. Get your tickets through the Box Office at 510-336-7373.

Join us for a family tradition at Chabot – the 9th Annual New Year's Eve Balloon Drop; a global, daytime celebration especially for kids! This event sells out early, so get your tickets now.

When the clock strikes 1 p.m. and 4 p.m. in Oakland, it's the New Year somewhere on the Earth. Your kids will have a blast ringing in 2009 without staying up past their bedtime! Kids 6 and under will have a separate balloon drop from kids aged 7-12. Includes all access to hands-on exhibits, observatory deck, and much more!



NGC253 - The Sculptor Galaxy. Image taken from Barcroft with a Canon 20DA and a Takahashi FSQ-106N on an AP900 mount. Guiding was with a SBIG E-Finder; combination of 5 exposures, each 5 minutes long. *Photo: Bill Drelling*

#### Officers

##### **President:**

Chuck Grant  
[cg@fx4m.com](mailto:cg@fx4m.com)  
925-422-7278

**Vice-President:**  
unfilled

##### **Treasurer:**

David Feindel  
[feindel1@comcast.net](mailto:feindel1@comcast.net)

##### **Secretary:**

David Woolsey  
[fatdawg@comcast.net](mailto:fatdawg@comcast.net)

##### **Board of Directors**

Alane Alchorn, Jim Alves,  
Debbie Dyke, Gert Gottschalk,  
Mike Rushford, John Swenson.

#### Volunteer Positions

##### **Librarian:**

Jim Alves  
[Ajaengr@yahoo.com](mailto:Ajaengr@yahoo.com)  
209-833-9623

##### **Newsletter Editor:**

Debbie Dyke  
[astrodeb@comcast.net](mailto:astrodeb@comcast.net)  
925-461-3003

**Program Director:** unfilled

##### **Loaner Scope Manager:**

John Swenson  
[johnswenson1@comcast.net](mailto:johnswenson1@comcast.net)

##### **Webmaster:**

Debbie Dyke

##### **Observatory Director/**

##### **Key Master:**

Chuck Grant

##### **School Star Party Chair:**

unfilled

#### **Public Star Party Chair:**

unfilled

#### **Historian:**

Debbie Dyke

#### **Mentor:**

Mike Rushford  
[rushford@eyes-on-the-skies.org](mailto:rushford@eyes-on-the-skies.org)

#### Addresses

##### Mailing:

Tri-Valley Stargazers  
P.O. Box 2476  
Livermore, CA 94551

##### Lecture Meeting:

Unitarian Universalist Church  
1893 N. Vasco Road, Livermore

##### Board & Discussion Meetings:

Round Table Pizza  
1024 E. Stanley Blvd., Livermore

#### Web & E-mail

[www.trivalleystargazers.org](http://www.trivalleystargazers.org)  
[trivalleystargazers@gmail.com](mailto:trivalleystargazers@gmail.com)

#### 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.

## News & Notes *continued*

TVS conducts star parties for any teacher, school, or group that requests our presence. We need a **Star Party Coordinator** to help organize the events and get the word out to members. Bonus points if s/he can help out with the star party, maybe do a little slide show, or do a Night Sky activity for the groups. We have an assortment of Night Sky Network activities for members to use for public outreach events.

Please consider helping out in whatever way you can, and don't be afraid to add your name to the nomination list.

### H2O Lock & Chain

As mentioned last month, we've had several instances of the gate lock at H2O being incorrectly locked, causing problems for other people needing access to that area (and beyond).

We now have a picture to show the correct method to locking the gate. The lock needs to be hooked up in a daisy chain with the other lock, otherwise the person using the other lock (PG&E) can't open the gate.



The Glorious Daisy Chain Effect—something we should all aspire to when visiting H2O. *Photo: Ken Sperber*

### Mt Tam Astronomy Program

*Tinka Ross*

Winter is on its way and the Mt. Tam Astronomy programs are over for the year. Feel free to offer your comments and advise on the programs. Any particular speakers or topics you want scheduled for next year? Save the 2009 dates now: May 2, May 31, June 27, July 25, August 22, September 19 and October 24.

The 2009 Astronomical Pocket Diary is now available for purchase. Still at just \$10 (plus \$1 for postage and handling) this is a bargain. There's more information than you can possibly use, all the observing times and positions are calculated for Mt Tam (useful for the Greater Bay Area) and the trivia is fun. You can get a look at the little book at [www.y23.com/apd](http://www.y23.com/apd). It's great for keeping yourself organized, in planning observing dates and for holiday gift giving. To get your copies just send a check payable to MTIA to Mt. Tam Astronomy Programs, c/o Tinka Ross, 89 Dominican Drive, San Rafael, CA 9490.

Thanks for supporting our programs, survive the winter and see you on the Mountain next spring!



M8 - The Lagoon Nebula. The Lagoon is a star forming region, about 5,000 light years away in Sagittarius.

Image taken at Barcroft with a Canon 20DA and a Takahashi FSQ-106N on an AP900 mount. Guiding was with a SBIG E-Finder; combination of 5 exposures, each 5 minutes long. *Photo: Bill Drelling*

### RASC Handbooks & Calendars

TVS had put in its order for a limited supply of RASC (Royal Astronomical Society of Canada) Handbooks and Calendars. The Handbook is a useful book filled with all kinds of astronomical data. The calendar features photos taken by amateur astronomers.

We will have them available for purchase at our Potluck meeting on December 21st. If you need a copy before then, please contact our Treasurer, David Feindel, to make arrangements for an early delivery.

The Handbooks are \$22, Calendars \$15. Cash or checks (made out to Tri-Valley Stargazers) accepted.

### Space Place Web Goodies for Kids and Teachers

NASA's Space Place has a host of games and activities for kids and teachers. Some recent items added to the web site include:

NASA's latest plans to return to the Moon are a lot more ambitious in many ways than was the Apollo Program in the '60s and '70s. This time, we plan to stay a while. NASA wants to learn how to keep the astronauts alive in a hostile environment for months at a time, so we will someday be able to send humans to Mars-and beyond! Designing a lunar habitat is part of the challenge. Kids can help to create a lunar outpost by building their own Moon Habitat, or even a whole village of them!

This fun activity that can involve the whole family can be found at NASA's website for kids, The Space Place: <http://spaceplace.nasa.gov/en/kids/exploration/habitat>.

## Astro Events

The SciJinks Weather Laboratory at <http://scijinks.gov> is a website for middle school-age children, sponsored by both NASA and NOAA. Skyjacks presents weather and other Earth science topics via games, stories, and fun facts, as well as simple, concise answer to often-asked “how and why” questions. For example, answers will be found to “Why is the sky blue?,” “How does a hurricane form?” and “Why do we have seasons?”

Two new “how & whys” have recently been added:

- \* How did earth’s atmosphere form?
- \* Why doesn’t the atmosphere just float off into space?

Other how and why topics are listed at [scijinks.gov/weather/howwhy](http://scijinks.gov/weather/howwhy). Additional weather-related resources for teachers are available at [scijinks.gov/en/educators](http://scijinks.gov/en/educators).

### Hubble Takes First Images of an Exoplanet

Hubble has imaged a planet orbiting a star other than our own. The star is Fomalhaut, 25 light years away in Piscis Australis; the star is named Fomalhaut b. For a look at the planet, go to <http://hubblesite.org/newscenter/archive/releases/2008/39/>.



M33 - The Triangulum Galaxy (aka the Pinwheel Galaxy). M33 is about 3 million light years away in the constellation of Triangulum. It’s about 50,000 light years in diameter, so it’s about half the size of our Milky Way Galaxy. However, it’s considered to be the third largest galaxy in our Local Group (behind Andromeda and the Milky Way).

Image taken at Barcroft with a Canon 20DA and a Takahashi FSQ-106N on an AP900 mount. Guiding was with a SBIG E-Finder; combination of 5 exposures, each 10 minutes long.

Photo: Bill Drelling

### Jupiter Transits

The following are a few listings of transit times for various Jupiter related objects. The abbreviations are fairly straight forward: G=Ganymede, C=Callisto, I=Io, E=Europa, GRS=Great Red Spot, and if you see a ‘s’ next to one of the moons, it means its shadow (e.g., Cs=Callisto’s shadow); na means Jupiter is below the horizon or it is daylight at that time. We’re at the end of the Jupiter viewing season for the year.

#### November

Mon 10	GRS	7:05p	na	na
Tue 11	GRS	na	na	6:50p
	E	6:45p	8:00p	na
Thur 13	GRS	na	6:30p	8:24p
Sat 15	I	na	na	6:09p
	Is	na	5:50p	7:10p
	GRS	6:20p	8:10p	na
Thur 20	GRS	5:40p	7:15p	na
Sat 22	I	5:53p	6:53p	8:09p
	Is	6:50p	7:45p	na
	GRS	7:03p	na	na
Sun 23	GRS	na	na	6:50p
Tue 25	GRS	na	6:30p	na
Thur 27	GRS	6:20p	na	na
Sat 29	Es	na	na	6:18p
Sun 30	GRS	na	5:37p	7:35p

#### December

Tue 2	GRS	5:40p	7:18p	na
Sat 6	E	na	5:55p	7:20p
	Es	6:08p	7:23p	na
Sun 7	GRS	na	6:22p	na
Mon 8	I	na	5:40p	6:41p
	Is	na	6:08p	7:23p
Tue 9	GRS	6:15p	na	na
Thur 11	G	na	5:25p	na
	Gs	6:46p	na	na
Fri 12	GRS	na	5:45p	na
Sun 14	GRS	5:30p	na	na
Mon 15	I	6:26p	na	na

## What's Up *by Debbie Dyke*

All times Pacific Standard unless otherwise noted.

### November

- 11 Tue Veterans Day.  
N. Taurid meteor shower peaks. 8:00 p.m.
- 12 Wed **Full Moon.** 10:17 p.m.  
1782 John Goodricke discovers the variability of Algol.
- 13 Thur 1790 Wilhelm Herschel discovers a planetary nebula, NGC 1514.  
1971 Mariner 9 becomes the first spacecraft to orbit Mars.
- 14 Fri Moon at perigee (222,562 miles). 2:00 a.m.
- 15 Sat 1738 Wilhelm Herschel born.
- 16 Sun 1974 Arecibo radio telescope sends a 3-minute message towards M13 — it should arrive in about 24,000 years.
- 17 Mon Leonid meteor shower peaks. 2:00 a.m.  
1970 Luna 17 lands on the Moon and sends Lunokhod 1 (a wheeled vehicle) to ramble along the surface.
- 18 Tue The Moon 2.5° from the Beehive Cluster (M44). 5:00 a.m.
- 19 Wed **Last Quarter Moon.** 1:31 p.m.  
1969 Apollo 12 lands at Oceanus Procellarum on the Moon.
- 20 Thur 1889 Edwin Powell Hubble born.  
1998 The first section of the International Space Station is launched from Baikonur.
- 21 Fri The Moon 5.5° from Saturn. 6:00 a.m.  
**Tri-Valley Stargazers general meeting.** 7:30 p.m. at the Unitarian Universalist Church, 1893 N. Vasco Road, Livermore.
- 22 Sat 1682 Edmond Halley sees the comet that will later bear his name.
- 23 Sun **Tri-Valley Stargazers discussion meeting.** 2:00 p.m. at the Round Table Pizza on 1024 E. Stanley Blvd., Livermore. Discuss astro stuff with your fellow members.  
Venus at greatest heliocentric latitude south.
- 24 Mon **Tri-Valley Stargazers Board meeting.** 7:30 p.m. at the Round Table Pizza in Livermore.
- 23 Sun 1885 First photo of a meteor shower.
- 25 Tue Mercury in superior conjunction. 9:00 a.m.
- 27 Thur **New Moon.** 8:55 a.m.  
**Thanksgiving Day.**  
Uranus stationary. 4:00 p.m.
- 28 Fri 1967 Jocelyn Bell discovers pulsars.
- 29 Sat Moon at apogee (252,01 miles). 9:00 a.m.  
1803 Christian Doppler born.

### December

- 2 Tue 1993 Hubble Space Telescope gets corrective optics.
- 3 Wed 1971 USSR's Mars 3 becomes the first spacecraft to make a soft landing on Mars.  
1973 Pioneer 10 becomes the first spacecraft to fly by Jupiter.
- 5 Fri **First Quarter Moon.** 1:26 p.m.  
Mars in conjunction with the Sun. 2:00 p.m.  
The Moon 3.5° from Uranus. 8:00 p.m.
- 8 Mon Eid al-Adha begins at sundown.
- 10 Wed The Moon occults the Pleiades (M45). 11:00 p.m.

## The Chemical Weather Report

“Sunny tomorrow with highs in the mid-70s. There’s going to be some carbon monoxide blowing in from forest fires, and all that sunshine is predicted to bring a surge in ground-level ozone by afternoon. Old and young people and anyone with lung conditions are advised to stay indoors between 3 and 5 p.m.”

Whoever heard of a weather report like that?

Get used to it. Weather reports of the future are going to tell you a lot more about the atmosphere than just how warm and rainy it is. In the same way that satellite observations of Earth revolutionized basic weather forecasting in the 1970s and 80s, satellite tracking of air pollution is about to revolutionize the forecasting of air quality. Such forecasts could help people plan around high levels of ground-level ozone—a dangerous lung irritant—just as they now plan around bad storms.

“The phrase that people have used is chemical weather forecasting,” says Kevin Bowman of NASA’s Jet Propulsion Laboratory. Bowman is a senior member of the technical staff for the Tropospheric Emission Spectrometer, one of four scientific sensors on NASA’s Aura satellite.

Aura and other NASA satellites track pollution in the same way that astronomers know the chemical composition of stars and distant planetary atmospheres: using spectrometry. By breaking the light from a planet or star into its spectrum of colors, scientists can read off the atmosphere’s gases by looking at the “fingerprint” of wave-

lengths absorbed or emitted by those chemicals. From Earth orbit, pollution-watching satellites use this trick to measure trace gases such as carbon monoxide, nitrogen oxide, and ozone.

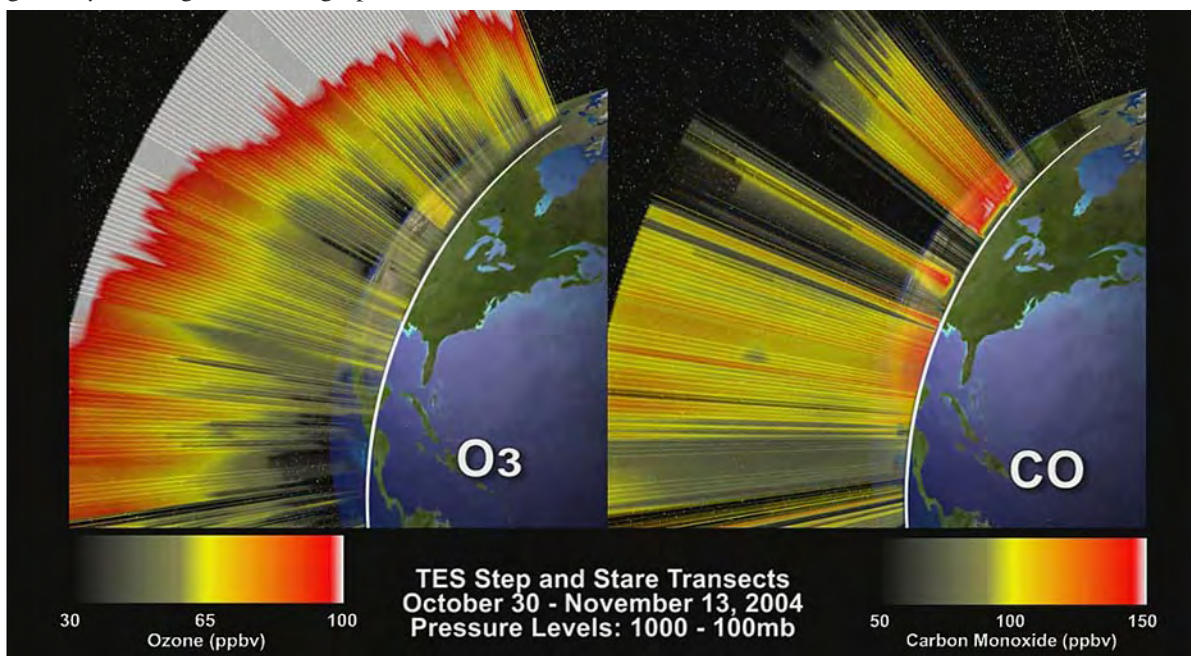
However, as Bowman explains, “Polar sun-synchronous satellites such as Aura are limited at best to two overpasses per day.” A recent report by the National Research Council recommends putting a pollution-watching satellite into geosynchronous orbit—a special very high-altitude orbit above the equator in which satellites make only one orbit per day, thus seeming to hover over the same spot on the equator below. There, this new satellite, called GEOCAPE (Geostationary Coastal and Air Pollution Events), would give scientists a continuous eye in the sky, allowing them to predict daily pollution levels just as meteorologists predict storms.

“NASA is beginning to investigate what it would take to build an instrument like this,” Bowman says. Such a chemical weather satellite could be in orbit as soon as 2013, according to the NRC report. Weather forecasts might never be the same.

Learn more about the Tropospheric Emission Spectrometer at [tes.jpl.nasa.gov](http://tes.jpl.nasa.gov).

Kids can learn some elementary smog chemistry while making “Gummy Greenhouse Gases” out of gumdrops at [spaceplace.nasa.gov/en/kids/tes/gumdrops](http://spaceplace.nasa.gov/en/kids/tes/gumdrops).

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



Example of visualization of data from the Tropospheric Emission Spectrometer. These frames are from an animation that steps through transects of the atmosphere profiling vertical ozone and carbon monoxide concentrations, combining all tracks of the Aura satellite during a given two week period.

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.  
\_\_\_\_\_ \$40 Regular. You will receive a paper version of *Prime Focus* in the mail.  
\_\_\_\_\_ \$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.