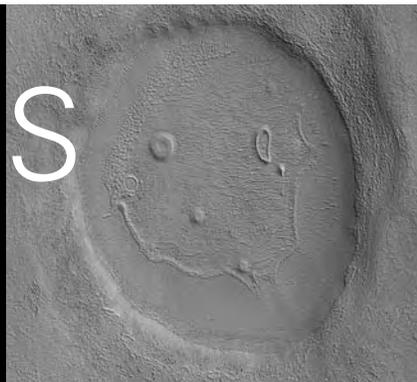


# PRIMEFOCUS

Tri-Valley Stargazers

February 2008



## Meeting Info:

### What

*Lunar Eclipse*

### Who

TVS Members

### When

February 15, 2008  
Doors open at 7:00 p.m.  
Lecture at 7:30 p.m.

### Where

Unitarian Universalist  
Church in Livermore  
1893 N. Vasco Road

## Inside

News & Notes	2
Calendar of Events	3
What's Up	6
NASA's Space Place	7
Membership/Renewal Application	8



## February Meeting

Lunar Eclipse  
*TVS Members*

A total lunar eclipse will be visible from the Bay Area on Wednesday, February 20th. For our February meeting, we'll discuss the upcoming eclipse, and give pointers on how to photograph it. The main trick is to "bracket, bracket, bracket". If you're not sure what that means, come to the meeting and find out! It's not that hard to get nice shots of a lunar eclipse.

Here's the time line of event:

- 4:36 Penumbral eclipse begins. The penumbra is the outer part of Earth's shadow, where the Earth is blocking some, but not all, of the Sun's light from reaching the Moon.
- 5:43 First Contact—partial umbral eclipse begins. The Earth's shadow first appears on the Moon. The umbra is where the Earth blocks all direct sunlight from reaching the Moon.
- 5:45 The Moon rises in the east. Saturn is below and 4° to the north.
- 7:01 Second Contact—totality begins. The Moon is completely in Earth's shadow.
- 7:26 Greatest Eclipse. The instant of greatest eclipse occurs when the distance between the Moon's shadow axis and Earth's geocenter reaches a minimum.
- 7:50 Third Contact—totality ends. The Earth's shadow starts to move away.
- 9:08. Umbral phase ends—partial eclipse ends
- 10:15 Penumbral eclipse ends—The Moon is completely out of the Earth's shadow.

The penumbral phase lasts 2 hours, 49 minutes. The umbral phase lasts 1 hour 42 minutes. Totality lasts 24 minutes.

For more information, visit Fred "Mr Eclipse" Espenak's web site: <http://www.mreclipse.com/MrEclipse.html#Moon>.

## News & Notes

### 2008 TVS Meeting Dates

The following lists the TVS meeting dates for the next few months. The lecture meetings are 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 March 9th deadline is for the March issue).

Lecture Meeting	Board Meeting	Prime Focus Deadline
Feb 15	Feb 18	Feb 3
Mar 21	Mar 24	Mar 9
Apr 18	Apr 21	Apr 6
May 16	May 19	May 4

### Money Matters

At our January board meeting, Treasurer **David Feindel** left word of the TVS account balances as of January 21, 2008.

Checking	\$3,113.89	
CD #1	\$3,685.97	matures 02/17/08
CD #2	\$2,599.00	matures 02/27/08

Our annual rental to the church (\$1200), as well as our dues for the WAA (Western Amateur Astronomers) are due in January.

### TVS Membership Renewal Time

Not to sound like a broken record, but TVS is at its membership renewal period. For those members who have already renewed, thank you! For those who like to procrastinate, now is the time to send in your renewal. You can find the renewal form on the back page of the newsletter. Please fill it out and send it in with your check to PO Box 2476, Livermore, CA 94551.

If you are renewing your *Sky & Telescope* subscription, you will need to do so through the magazine. They will be sending you notices when your subscription is coming to an end. Subscription rate is \$32.95 this year.

If you are renewing your *Astronomy* magazine subscription, please do so through the club. A one year subscription is \$34, two years is \$60. If you have questions regarding the subscriptions, contact club Treasurer David Feindel.

### RASC Handbooks & Calendars

We still have RASC (Royal Astronomical Society of Canada) Handbooks and Calendars available for purchase. The Handbooks are \$21, Calendars \$13. Cash or checks (made out to Tri-Valley Stargazers) accepted. If you wish a Handbook or Calendar (or both!) and won't be able to attend the February meeting, contact Treasurer David Feindel to reserve a copy.

### Jane's Updates

Jane Houston Jones, hard at work as JPL's Cassini Program Senior Outreach Specialist, sends word of some of the latest goings on at JPL.

"There are a lot of really interesting multimedia offerings on the JPL web site this month.

On JPL's front page <http://www.jpl.nasa.gov/index.cfm> you'll find:

What's Up - a short podcast showcasing a unique view of the night sky. January's podcast is available, a little later than usual, due to so much going on in space and science-wise, in January, including . . .

Cassini at Saturn Interactive Explorer - NASA's first 3-D interactive mission experience using a web browser.

Explorer 1, the first US Earth-orbiting satellite, launched January 31, 1958.

Scroll past the top features to News and Features for:

Cassini finds Rhythm in Saturn's Rings

January 29 - Asteroid zooms by Earth

And finally, NASA and the Beatles celebrate anniversaries by beaming *Across the Universe* into Deep Space. <http://www.jpl.nasa.gov/news/news.cfm?release=2008-019>.

February 20 is the date of a great early evening total lunar eclipse, and February 24th is Saturn Opposition. Both offer great opportunities to show what's up!"

### 10 Podcasts of Nontechnical Astronomy Talks Available

Audio recordings of ten public lectures by noted astronomers are now available as free MP3 downloads at the web site of the nonprofit Astronomical Society of the Pacific (ASP): <http://www.astrocity.org/education/podcast/index.html>

These talks were recorded at Foothill College in the Silicon Valley Astronomy Lecture Series. They are made available through a kind donation to the ASP by a donor with a strong interest in education who wishes to remain anonymous. Each hour-long lecture on some exciting development in our study of the universe is followed by

*continued page 5*

**Newsletter header image:** Another face on Mars.

At least this one seems to be happy. This unnamed crater on Mars is about 2 miles across. It's located among the Nereid Montes, north of the Argyre basin. The picture was taken by the Context Camera (CTX) onboard the Mars Reconnaissance Orbiter on January 28, 2008. North is toward the right and sunlight illuminates the scene from the upper right. *Photo: NASA/JPL/MSSS*

## Calendar of Events

### February 9, 10:00 a.m.

**What:** *Chinese New Year Celebration*  
**Who:** Chabot Visitors  
**Where:** Chabot Space & Science Center  
**Cost:** Free with General Admission

Ring in the Year of the Rat (Chinese year 4706) at Chabot with crafts and hands-on traditional Chinese activities for kids. San nin faai lok, kung hei fat choi.

### February 16, 3:30 p.m. and 5:30 p.m.

### February 17, 1:30 p.m. and 3:30 p.m.

**What:** *Valentine's Day Love Missions*  
**Who:** Chabot Visitors  
**Where:** Chabot Space & Science Center  
**Cost:** \$80 per couple / \$75 members

Celebrate with your Valentine and take a simulated space mission to the "Red Planet," Mars.

Includes Ghirardelli Chocolates, fizzy beverage, and a souvenir of your trip to outer space. Couples are stranded on a spacecraft and they need to use teamwork to fix it and continue to Mars.

Tickets available at the Sales Office, 510-336-7311 or e-mail groupsales@chabot.space.org.

### February 19, 8:00 p.m.

**What:** *"In Conversation"*  
**Who:** Neil deGrasse Tyson  
**Where:** Herbst Theatre, San Francisco  
**Cost:** \$19.00

City Arts and Lectures present Neil deGrasse Tyson in conversation with Ryan Wyatt, *The Annual Claire*

*Matzger Lilienthal Distinguished Lecturer* at the Herbst Theatre, 401 Van Ness Avenue, San Francisco.

Whether discussing the universe's origins as host of NOVA's *scienceNOW* or asserting that Pluto is a not a planet on *The Colbert Report*, astrophysicist Neil deGrasse Tyson translates the universe's complexities for a broad audience. Known as the great explainer of all things cosmic, Tyson first became known in the astronomy community by lecturing on the subject at the age of fifteen. He is currently the director of New York's Hayden Planetarium at the American Museum of Natural History, where he also teaches. Tyson has written seven popular books including the bestselling *Death by Black Hole* and the memoir *The Sky Is Not The Limit*. His professional research explores star formation, dwarf galaxies, exploding stars, and the structure of the Milky Way, topics which he writes about in his long running *Universe* column in Natural History magazine. Tyson's varied honors include the NASA Distinguished Public Service Medal and People Magazine's 2000 "Sexiest Astrophysicist Alive."

Most City Arts & Lectures programs can be heard in edited and delayed broadcasts in the San Francisco Bay Area on KQED-FM (88.5) on Sundays at 1:00 p.m., Tuesday evenings at 8:00 p.m., and Wednesday mornings at 2:00 a.m. Neil's program is scheduled to be aired starting on May 4th.

To order tickets, please call City Box Office at 415-392-4400 or visit [www.cityboxoffice.com](http://www.cityboxoffice.com). For more information see: <http://www.cityarts.net>

*continued page 4*

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#### **Addresses**

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 Livermore, CA 94551

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 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)  
 tvs@trivalleystargazers.org

#### **Eyes on the Skies**

Eyes on the Skies is a robotic solar telescope run by Mike Rushford (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 (tvs@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*



IC1805 - The Heart Nebula. IC1805 is a large emission nebula about 7,500 light years away in the constellation Cassiopeia. The red color of the nebula is caused by hydrogen gas. In the middle of the heart is a small open cluster of stars.

This picture was a two hour exposure using a Nikon FM-10 camera and Kodak E200 Professional slide film, taken at last year's Barcroft trip. The set up was a Takahashi FSQ-106 refractor on an AP900 mount, with the help of a SBIG STV E-Finder guider. *Photo by Bill Drelling*

### **February 20, 5:00- 8:00 p.m.**

**What:** *Total Lunar Eclipse: Red Moon Rising*  
**Who:** Chabot Visitors  
**Where:** Chabot Space & Science Center  
**Cost:** Varies—see below

Celebrate the “Red Moon Rising” with your family in the center or on a guided hike. Inside Chabot, see lunar eclipse live planetarium presentations, hands-on activities, and telescope viewing from the observation deck. The guided hike (approx. 3 miles, round trip) will start from Chabot at 5:00 p.m. You’ll watch the moonrise and eclipse on the trails near the center and return to Chabot after the eclipse. For the hike, bring warm clothing, water and a flashlight.

The Moon rises above Chabot between 6:30 p.m. and 7:00 p.m. Mid-eclipse is at 7:25 p.m.

Buying tickets in advance is encouraged for both events. Space is limited for the hike. Early Bird Special through February 13: \$8 adults / \$5 youth, seniors, students. After February 13: \$10 adults / \$8 youth, seniors, students. Members: \$5 adults, youth, seniors, students

To sign up, call the Box Office at 510.336.7373.

### **February 25, 7:30 p.m.**

**What:** *Visualizing the Infrared Universe: The Imagery of NASA’s Spitzer Space Telescope*  
**Who:** Dr. Robert Hurt, California Institute of Technology

**Where:** Kanbar Hall, Jewish Community Center  
**Cost:** \$4.00

Astronomy is arguably the most visual of sciences, even when it transcends the limits of mere human vision. Astronomers are but observers, reconstructing events long ago and far away by collecting light across the entire spectrum of light. NASA’s Spitzer Space Telescope presents interesting challenges in visualization. How do you represent data from beyond the visible spectrum that can be seen and admired, but also understood? What role does art play in communicating the science of the universe?

You can purchase tickets online at <http://www.calacademy.org/lectures/tickets> or buy them at the door. For more information, call 415-321-8000.

The Dean Lectures have temporarily moved to the San Francisco Jewish Community Center at 3200 California Street (at Presidio Avenue) during the reconstruction of the Academy.

Parking is available across the street in the UCSF Laurel Heights campus parking lot for \$1.25 per night. Parking in the JCC garage is \$1.25 per half-hour. 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 buses stop only a few blocks away.

### **February 28, 6:30 - 8:30 p.m.**

**What:** *Astronomy Basics: More Than Meets the Eye*  
**Who:** Chabot Visitors  
**Where:** Chabot Space & Science Center  
**Cost:** \$95 Regular / \$85 Members

4 sessions: February 28, March 6, 13 & 20.

Learn the basics of astronomy through a combination of classroom and planetarium presentations, hands-on activities, and some casual stargazing under the clear night skies above Chabot. Learn to see celestial objects and their motions as ancient sky observers saw them, while exploring our modern scientific understanding of them as well. Probe the Solar System to learn of new discoveries about the old planets that you have been familiar with since childhood. Take a trek through the stars and beyond, going where only imagination and computers can take us. Peer deeply into the rich tapestry of the sky to discover that in our universe there is far, far more than meets the eye.

Announcement: *More Than Meets the Eye* is companion to a new class that we will be offering in the early autumn. This new class will focus primarily on real sky observation and hands-on use of telescopes, both large and small, to explore objects in the sky through the light-gathering power of lenses and mirrors.

E-mail [adultedu@chabotspace.org](mailto:adultedu@chabotspace.org) to reserve your space!

## News & Notes *continued*

an extensive question and answer period, in which the speaker gives further details and personal glimpses about the topics under discussion.

Among the talks available so far are:

- \* Dr. David Morrison (NASA Ames Research Center): *Taking a Hit: Asteroid Impacts and Evolution*
- \* Dr. David Grinspoon (Denver Museum of Nature & Science): *Comparing Worlds: Climate Catastrophes in the Solar System*
- \* Dr. Bruce Margon (University of California, Santa Cruz): *Glimpsing the Edge of the Universe: Results from the Hubble Space Telescope*
- \* Dr. Dale Cruikshank (NASA Ames): *The Planet Pluto: Maligned but Not Forgotten*
- \* Dr. Alex Filippenko (University of California, Berkeley): *Dark Energy and the Runaway Universe*
- \* Dr. Frank Drake (SETI Institute): *Estimating the Chances of Life Out There*
- \* Dr. Nathalie Cabrol (SETI Institute): *The Mars Exploration Rover Mission*

A few talks are also available as video files (instructions can be found on the same page).

### SJAA Auction

Mark your calendar—the famous SJAA auction will be held this year on April 20. Some adjustments in their telescope lending program means that there may be more bargains than usual this year.

### 2008 Star Parties

It's never too early to start making plans to attend the various star parties in California. Here are just a few of the more popular star parties.

Riverside Telescope Makers Conference (RTMC)—May 23-26 (always on Memorial Day Weekend)  
<http://www.rtmcastronomyexpo.org>

RTMC was founded in 1969 by Clifford W. Holmes as a way for amateur telescope makers to share their craft. It has expanded to encompass all aspects of amateur astronomy from beginning to advanced topics and from telescope making to “armchair” astronomy.

Located 50 miles northeast of Riverside in the San Bernardino mountains, the site offers space for camping, several dormitories and 18 three-sided shelters, a meeting/dining hall, and the Charles Walker Observatory. The camp is located at an elevation of 7,600 feet.

Shingletown Star Party—June 30-July 7  
<http://www.shingletownstarparty.net>

Located on an unused airstrip at an altitude of 4,000 feet in Northern California, this site usually has skies to at least mag 7. There is room for more than 300 telescopes along the airstrip (and the area could be expanded if needed). Horizons are excellent all around, and the site boasts a superb daytime view of Mt. Lassen. You can camp out in a tent, bring your RV, or rent a nearby cabin. You can leave your equipment set up for the entire week. Shower facilities are available (and included in the registration fee), and there are many daytime activities to enjoy in the area. Imagers will have power provided for their equipment.

They also boast a dinner delivery service to your telescope, and a café where you can get a sno-cone to help you cool off in the daytime, as well as freshly brewed coffee at 2 a.m. A number of vendors will attend SSP—check the vendor list after April 10. If you register early, the fee is only \$40 for the entire week. For all the details, and to register, visit the web site.

### Golden State Star Party—July 2-6

<http://goldenstatestarparty.blogspot.com>

On Frosty Acres Ranch near Adin in northeast California, GSSP is at an elevation of 4,400 feet atop a large bluff. The location combines the amenities of nearby small towns and distance from city lights.

You can tent camp, bring an RV (but there are no hook-ups), or stay at off-site accommodations in nearby towns. There will be a stall shower truck, and plenty of porta-potties, along with wash basins.

Registrations will only be accepted on-line. Payment can be made by Paypal, Credit Card, or Check. Early registration is \$45. After April 15th, it goes up to \$55. \$65 at the gate.



IC410 - the Flaming Star Nebula. The nebula surrounds the cluster NGC1893. This object is located in Auriga. Image was taken with a 4" F8 APO & 0.67x reducer. Exposure times were: H-Alpha: 170 min.; RG: 30 min.; B: 40 min.; ST10SME 1x1 -20C, January 2008.

Photo by Gert Gottschalk

## What's Up *by Debbie Dyke*

All times Pacific Standard Time.

### February

- 6 Wed **New Moon.** 7:44 p.m.  
Mercury in inferior conjunction. 10:00 a.m.  
Venus, Mercury, and Uranus low in the west right after sunset.  
1971 Alan Shepherd (Apollo 14) is the first person to play golf on the Moon.
- 7 Thur Chinese New Year. It's the Year of the Rat.  
Venus and Uranus  $0.75^\circ$  from each other, low in the west. 7:00 p.m.  
1889 The Astronomical Society of the Pacific is formed.
- 10 Sun Neptune in conjunction with the Sun. 6:00 p.m.
- 12 Tue 1809 Charles Darwin born.
- 13 Wed Moon at perigee (229,535 miles). 5:00 p.m.  
**First Quarter Moon.** 7:33 p.m. Moon  $5^\circ$  from the Pleiades.
- 14 Thur Valentine's Day.
- 15 Fri **Tri-Valley Stargazers general meeting.** 7:30 p.m. at the Unitarian Universalist Church,  
1893 N. Vasco Road, Livermore.  
The Moon  $1.5^\circ$  from Mars. 11:30 p.m.  
1564 Galileo Galilei born.
- 17 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.
- 18 Mon **Tri-Valley Stargazers Board meeting.** 7:30 p.m. at the Round Table Pizza in Livermore.  
President's Day  
The Moon occults the Beehive Cluster (M44). 11:00 p.m.  
1930 Clyde Tombaugh discovers Pluto using the 13-inch scope at Lowell Observatory.
- 20 Wed **Full Moon. Total Lunar Eclipse.** 7:30 p.m.  
The Moon rises at 5:45 p.m. at the start of the penumbral phase. Totality starts at 7:01 p.m. and ends  
at 7:50 p.m. The penumbral phase ends at 9:08 p.m.  
1962 John Glenn becomes the first American in orbit.
- 21 Thur Saturn  $3.5^\circ$  from the Moon. 4:00 a.m.
- 23 Sat Zodiacal Light will be visible in the west after evening twilight for the next two weeks.
- 24 Sun Saturn at opposition. 2:00 a.m.  
1968 Cambridge University astronomers publish their discovery of pulsars in *Nature*.
- 27 Wed Moon at apogee (250,754 miles). 5:00 p.m.
- 28 Thur **Last Quarter Moon.** 6:18 p.m.
- 29 Fri Leap Day!

### March

- 3 Mon Mercury at greatest elongation west ( $27^\circ$ ). 3:00 a.m. PST
- 5 Wed The Moon close to Mercury, Venus, and Neptune.
- 7 Fri **New Moon.** 9:14 a.m. PST
- 8 Sat Uranus in conjunction with the Sun. 12:00 p.m. PST
- 9 Sun **Daylight Saving Time begins.** 2:00 a.m.  
Mars  $1.75^\circ$  from M35. 11:00 p.m.
- 10 Mon Moon at perigee (227,104 miles) 3:00 p.m.
- 11 Tue Mercury at aphelion.

## No Mars Rock Unturned

by Patrick L. Barry

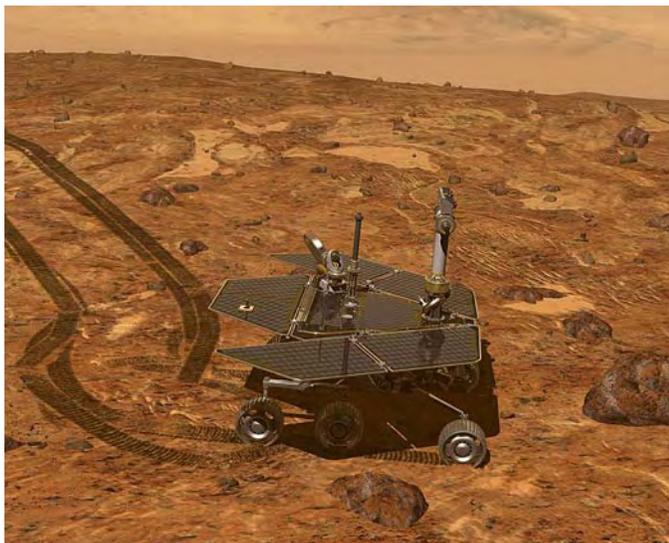
Imagine someday taking a driving tour of the surface of Mars. You trail-blaze across a dusty valley floor, looking in amazement at the rocky, orange-brown hillsides and mountains all around. With each passing meter, you spy bizarre-looking rocks that no human has ever seen, and may never see again. Are they meteorites or bits of Martian crust? They beg to be photographed.

But on this tour, you can't whip out your camera and take on-the-spot close-ups of an especially interesting-looking rock. You have to wait for orders from headquarters back on Earth, and those orders won't arrive until tomorrow. By then, you probably will have passed the rock by. How frustrating!

That's essentially the predicament of the Spirit and Opportunity rovers, which are currently in their fourth year of exploring Mars. Mission scientists must wait overnight for the day's data to download from the rovers, and the rovers can't take high-res pictures of interesting rocks without explicit instructions to do so.

However, artificial intelligence software developed at JPL could soon turn the rovers into more-autonomous shutterbugs.

This software, called Autonomous Exploration for Gathering Increased Science (AEGIS), would search for interesting or unusual rocks using the rovers' low-resolution, black-and-white navigational cameras. Then, without waiting for instructions from Earth, AEGIS could direct the rovers' high-resolution cameras, spectrometers, and thermal imagers to gather data about the rocks of interest.



Are these rocks of any scientific interest? With the new AEGIS software, the Mars Rovers, Spirit and Opportunity, will be able to judge for themselves whether a scene is worth a high-resolution image. (Artist's rendering)

“Using AEGIS, the rovers could get science data that they would otherwise miss,” says Rebecca Castaño, leader of the AEGIS project at JPL. The software builds on artificial intelligence technologies pioneered by NASA's Earth Observing-1 satellite (EO-1), one of a series of technology-testbed satellites developed by NASA's New Millennium Program.

AEGIS identifies a rock as being interesting in one of two ways. Mission scientists can program AEGIS to look for rocks with certain traits, such as smoothness or roughness, bright or dark surfaces, or shapes that are rounded or flat.

In addition, AEGIS can single out rocks simply because they look unusual, which often means the rocks could tell scientists something new about Mars's present and past.

The software has been thoroughly tested, Castaño says, and now it must be integrated and tested with other flight software, then uploaded to the rovers on Mars. Once installed, she hopes, Spirit and Opportunity will leave no good Mars rock unturned.

Check out other ways that the Mars Rovers have been upgraded with artificial intelligence software at [nmp/TECHNOLOGY/infusion.html#sciencecraft](http://nmp/TECHNOLOGY/infusion.html#sciencecraft).

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

## Challenge Yourself with Weather Slyders

The Dust Bowl. Hot, loopy solar gases. Killer Katrina. Combining dramatic images of Earth and space weather with the challenge of an old-fashioned slider puzzle, the new “Slider” game on the SciJinks Weather Laboratory website will capture the attention of any middle-schooler—and maybe even their parents and teachers. Players pick from a rich variety of captioned images, including photos from the ground, photos from space, and artist's renderings. After picking a difficulty level (3x3, 4x4, 5x5 grids), the player slides the scrambled tiles around to make a whole picture again. Go to <http://scijinks.gov/weather/fun/slyder> to become the newest Slider buff!

## Is Time Travel Possible?

Every science fiction fan has pondered the weird implications of time travel. Can you travel into the future and find out the winning Super Lotto number—then come back and buy a ticket? Would doing so be cheating the laws of physics (to say nothing of ethics)? Astrophysicist Marc Rayman toys with such ideas in this Space Place Musings Podcast. Go to <http://spaceplace.jpl.nasa.gov/en/educators/podcast/> to subscribe to these Podcasts. Or listen now to this and the previous Podcasts on your computer or read the transcripts.

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.