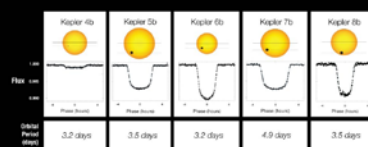


# PRIMEFOCUS

Tri-Valley Stargazers

Transit Light Curves



March 2011



## Meeting Info:

What: How to Upgrade Your Astronomy Camera: A Somewhat Different Approach

Who: Ron Bissinger

When:

March 18, 2011  
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
Journal Club	2
Calendar of Events	3
What's Up	6
NASA's Space Place	7
Membership/Renewal Application	8

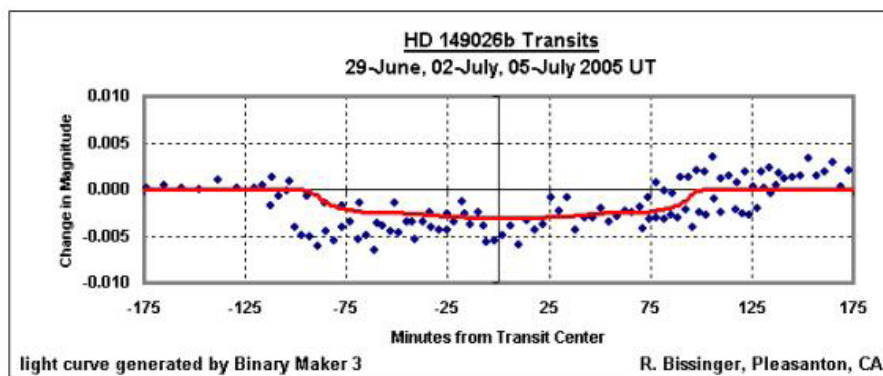
## March Meeting

How to Upgrade Your Astronomy Camera:  
A Somewhat Different Approach

Ron Bissinger

Usually an amateur astronomer will just sell their old astronomy camera and buy a new, fancier one. Usually, but not always. In one case, an amateur astronomer bought a major astronomy camera company. While he really did want a new camera, the reason for buying SBIG (the Santa Barbara Instrument Group) resulted from an intersection of his personal hobby with his professional career.

One of TVS's own, Ron Bissinger, will explain why he sees SBIG not only continuing to serve the astronomy community but also why SBIG will become a key component of a larger life sciences instrumentation company. Ron will share some thoughts on the future of astro imaging and also discuss the challenges astronomy equipment suppliers face to succeed as profitable businesses.



Caption: Ron Bissinger's observations and best-fit light curve of exoplanet HD 149026b. These data were obtained using a 12" SCT from Racoon Run Observatory, located in Pleasanton, CA.

Mr. Bissinger, former CEO of Alpha Innotech Corp., drove rapid global revenue growth and increasing profitability prior to the company's sale in late 2009. He is also an accomplished amateur astronomer and a long time user of SBIG products. He was an early contributor in the use of amateur telescopes and cameras to detect planets orbiting other star systems. In 2007 Mr. Bissinger received the Chambliss Amateur Achievement Award by the American Astronomical Society for his contributions to astronomical research. His work has been published by CNN, Reuters, The Economist, The New Scientist, The Christian Science Monitor, Sky & Telescope, and Astronomy, and he was featured in the PBS documentaries "Seeing in the Dark" and "Hunting the Edge of Space." For more information about Ron's astronomical exploits, see: <http://home.comcast.net/~ronbissinger/>

## News & Notes

### 2011 TVS Meeting Dates

The following lists the TVS meeting dates for 2011. 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
Mar. 18	Mar. 21	
Apr. 15	Apr. 18	Mar. 31
May 20	May 23	Apr. 29
Jun. 17	Jun. 20	May 27
Jul. 15	Jul. 18	Jun. 24
Aug. 19	Aug. 22	Jul. 29
Sep. 16	Sep. 19	Aug. 26
Oct. 21	Oct. 24	Sep. 30
Nov. 18	Nov. 21	Oct. 28
Dec. 16	Dec. 19	Nov. 25

### Money Matters

Treasurer David Feindel indicates that as of February 12, 2011 the TVS account balances are:

Checking	\$5,823.09
CD #1	\$3,763.79 rolled over 2/17/2011
CD #2	\$2,656.35 rolled over 11/27/2010

### TVS Positions Available

We still need people to fill the positions of Vice-President and Secretary, and to serve on the Board of Directors. Please consider offering some of your time to influence the future direction of TVS. If you wish to help with any of these positions, please contact any officer or board member.

### RASC Handbooks and Calendars Available

David Feindel may have Royal Astronomical Society of Canada (RASC) Handbooks and Calendars for purchase. The pricing is \$22 for the Handbook, and \$15 for the Calendar. Pictures of them are available on the [www.rasc.ca](http://www.rasc.ca) website.

## Journal Club by Ken Sperber

In April and May I have extensive work-related travel, and I may not have the time to produce a Journal Club column. Should anyone wish to contribute an article of any type for publication in PrimeFocus, please do so.

Just last week I experienced the Japan earthquake firsthand. I and my colleagues were lucky to have been in Tsukuba Japan, a relatively new city about 40 miles northeast of Tokyo. The shaking was almost beyond description. We were on the third floor of the convention center when the earthquake hit. It started out similar to the 7.2 magnitude

earthquake that two days before had rattled the monsoon conference we were attending. After about 25 seconds it really ramped up and we all went under the tables for the next 2+ minutes, as all hell broke loose. The shaking was mostly side to side, and it was like being on the most intense roller coaster ride of your life, but with higher frequency oscillations. At least on a roller coaster you know it is only you being jostled about, but in this case you realize it is the whole world around you that is moving, and you are just a "fly" along for the ride. Fortunately, I'd wrapped my arm around the table leg, as by the time the quake was over the table had migrated 2-3 feet across the floor. A friend and close colleague had flown to Japan to attend the end of the monsoon workshop, and participate in the half-day meeting I was chairing. About half-way through the earthquake I tried to inject a bit of nervous humor, asking him if he thought it was worth it to come to Japan for a 1-day meeting. The noise was very loud, as the building creaked and groaned, and then we heard metal ceiling tiles coming down in the room and elsewhere. About 30 seconds after it was over, we evacuated the building. I noticed some fist-sized pieces of concrete scattered about, but not much considering the extreme conditions. What amazed me was that there was no broken glass. We evacuated to the parking lot, only to be greeted by a 7.1 aftershock about 30 minutes later. It was hard to stand, and the vibration of the window glass was a sight to see. Through it all, there was no panic. Fortunately, the conference center wireless did not go down, so I and others were able to send out emails that we were OK. Eventually, we got information on the tsunami, and realized that the situation was far worse than we'd experienced. If it weren't for the tsunami, the country would have been in good shape, a testament to the building codes that saved our lives. We continued to be hit by 5.x aftershocks every few minutes, with the occasional 6.x thrown in. Even so, the town structures stoutly withstood, with no evidence of collapse, though we saw some cracked bridge supports, and merchandise scattered about in the shopping mall stores.

The hotel restaurant was the designated shelter. Flashlights and candles provided light, as the building's power was out, though most of the city had electricity. Our hosts were fantastic, bringing us food from their homes, until the hotel got its generators going to provide hot soup to the guests. At about 10pm we were allowed to go to our rooms for the night, though I and many other choose to (try to) sleep in the restaurant or hotel lobby. At 3am the power came back on, and I was so tired I decided to go to my room on the 4th floor. It was not too disheveled, so I figured it would be OK. After a quick shower (with hot water!) I lay in bed, clothed and ready

Header Image: These light curves of Kepler's first five planet discoveries show not only drop in star brightness as the planet transits the star, but an indication of the planet's inclination--how far from the center the planet is passing across the star. Credit: NASA/Kepler Mission.

## Calendar of Events

to get out at a moment's notice. I managed a bit of sleep, but mostly I was kept awake by the aftershocks. My colleagues who had rooms on higher floors were too uncomfortable to stay in their rooms. With the greater sway, their rooms looked more like some rock star had gone nuts. The next morning our hosts worked to get us bus tickets to Narita Airport, and ensure that we got out safely. The 1.5 hour bus ride to Narita was uneventful, and the damage we saw was mainly to roof tiles of homes where the Pagoda peaks did not withstand the shaking. I was lucky to have had a confirmed seat on an available plane. It was the poor folks that had missed their previous day's flights who were scrambling to get out. With only a 1-hour delay, which seemed like an eternity, my flight to SFO departed, and I was safely home 10 hours later.

For more information on the earthquake characteristics see: <http://earthquake.usgs.gov/earthquakes/eqinthenews/2011/usc0001xgp/#details> and [http://outreach.eri.u-tokyo.ac.jp/eqvolc/201103\\_tohoku/eng/#NIED](http://outreach.eri.u-tokyo.ac.jp/eqvolc/201103_tohoku/eng/#NIED)

If you have the means, consider making a donation toward earthquake/tsunami relief.

According to calculations performed by Richard Gross of JPL, the earthquake was powerful enough to have shortened the length of day by 1.8 microseconds, and shift the Earth's figure axis ("the axis about which Earth's mass is balanced") by 6.5 inches. Typical year-to-year fluctuations that occur due to atmospheric winds and ocean circulation cause rotation rate changes of about 1 milisecond, and of about 3 feet in the location of the figure axis. Given available instrumentation, the earthquake induced change to length of day is probably not detectable, but the shift of the figure axis is well within our observational capability. For more information see: <http://www.jpl.nasa.gov/news/news.cfm?release=2011-080>

### March 23, Noon - 1:00 pm

**What:** Crowdsourcing SETI - How you can participate  
**Who:** Avinash Agrawal, SETI Institute  
**Where:** SETI Headquarters, 189 N. Bernardo Ave., Mountainview  
**Cost:** Free

No details of this talk are 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 23, 6:00 pm

**What:** Hot: The Next 50 Years on Earth  
**Who:** Dr. Healy Hamilton, CAS  
**Where:** Koret Auditorium, San Francisco Public Library, 100 Larkin Street  
**Cost:** Free

Healy Hamilton, the director of the Center for Applied Biodiversity Informatics at the California Academy of Sciences talks with freelance science journalist Mark Hertsgaard about his latest book titled "Hot: The Next 50 Years on Earth". In this conversation you will hear about how climate change is altering weather patterns around the world and how it will impact localized weather related events in unique and unexpected ways. Hertsgaard's book takes an optimistic look at how we can adapt to the altered state of life that comes with climatic changes. Learn about how plants and animals, including humans, are already beginning to shift in response to the changing world around them.

Reservations: Seating is limited. Reserve a Space Online or call 800-794-7576 to ensure your seat today. Book signing to follow.

continued page 4

#### **Officers**

##### **President:**

Chuck Grant  
cg@fx4m.com  
925-422-7278

##### **Vice-President:**

unfilled

##### **Treasurer:**

David Feindel  
feindel1@comcast.net

##### **Secretary:**

unfilled

#### **Volunteer Positions**

##### **Librarian:**

Jim Alves  
ajaengr@yahoo.com  
209-833-9623

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

Ken Sperber  
sperbs13@yahoo.com  
925-361-7435

##### **Program Director:**

Jim Alves  
ajaengr@yahoo.com

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

John Swenson  
johnswenson1@comcast.net

##### **Webmaster:**

Hilary Jones  
hdjones@pacbell.net

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

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

Chuck Grant

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

Wayne Miller  
starpartytvs@gmail.com

#### **Historian:**

unfilled

#### **Mentor:**

Mike Rushford  
rushford@eyes-on-the-skies.org

#### **Refreshment Coordinator:**

Laurie Grefsheim

#### **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 ([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)

### March 30, Noon - 1:00 pm

**What:** Exchanging Information with the Stars: Wide-Area Communication Writ Large

**Who:** David Messerschmitt, Department of EE and CS, UC Berkeley and SETI Institute

**Where:** SETI Headquarters, 189 N. Bernardo Ave., Mountainview

**Cost:** Free

The search for extraterrestrial intelligence has sought radio beacons devoid of information content. It seems likely, however, that a civilization transmitting a radio signal intended for our detection will also be motivated to embed information within the signal, especially in view of the large speed-of-light latencies. Successful exchange of information by radio with intelligent civilizations in distant solar systems requires an understanding of the end-to-end communication system design, including resources available to transmitter and receiver and properties of radio propagation in the interstellar medium. Although interstellar space is nearly an ideal vacuum, it contains sufficient low-density plasma to profoundly affect radio transmission over interstellar distances. The primary impairments are attenuation, thermal noise, plasma dispersion, scattering, and interference in the vicinity of the receiver. The most difficult technical challenge is initial discovery of a signal, and the primary obstacles are the infeasibility of coordination between transmitter and receiver and related "needle in a haystack" issues. Impairments are actually helpful as an implicit form of coordination through constraining design choices as well as constraining the size of the "haystack". In this talk, Dr. Messerschmitt will address end-to-end communication system design emphasizing noise, dispersion, and interference, deferring scattering to future work. He will show that an effective means of countering interference without compromising noise immunity is spread spectrum signaling, and proceed to characterize the effect of plasma dispersion upon these broadband signals. The conclusion is that while design considerations provide guidance as to carrier frequencies and bandwidth and time duration of signals, there is also a demonstrated tradeoff between transmit power and the computational burden placed on the receiver.

### April 4, 7:30 pm

**What:** The New Universe and The Human Future

**Who:** Prof. Joel R. Primack and Nancy Ellen Abrams, Esq.

**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 800-794-7576

In the centuries since Newton, scientifically minded people have thought of Earth as a lonely rock orbiting an average

star in a universe where no place is special. Modern cosmology, however, is now giving us a completely new picture of the universe based on dark matter, dark energy, and the drama of cosmic evolution. In this talk, Abrams and Primack will explain the new picture with stunning astronomical videos and relate it to life here on Earth, suggesting ways of understanding the global issues of our time in their cosmic context.

See <http://www.calacademy.org/events/lectures/> for more information.

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

### April 6, Noon - 1:00 pm

**What:** The Organism/Organics Exposure to Orbital Stresses (O/OREOS) NanoSatellite Mission

**Who:** Richard Quinn, SETI Institute

**Where:** SETI Headquarters, 189 N. Bernardo Ave., Mountainview

**Cost:** Free

No details of this talk are 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.

### April 7, 8:00 pm

**What:** Packing For Mars

**Who:** Mary Roach, Best Selling Author

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

**Cost:** Adults \$12, Academy members \$10.

Reserve a Space Online or call 800-794-7576

Join us at NightLife for our annual Yuri's Night party. This year marks the 50th anniversary of Yuri Gagarin's famous flight that made him the first human to orbit the Earth and an instant international hero. Mary Roach joins the party this year with a talk about her latest book *Packing For Mars Space* is a world devoid of the things we need to live and thrive: air, gravity, hot showers, fresh produce, privacy, beer. How much can a person give up? How much weirdness can they take? What happens to you when you can't walk for a year? What happens if you vomit in your helmet during a space walk? Is it possible for the human body to survive a bailout at 4,000 miles per hour? To answer these questions, space agencies set up all manner of quizzical and startlingly bizarre space simulations -- making it possible to preview space without ever leaving Earth. From the space shuttle training toilet to a crash test of NASA's new space capsule, *Packing for Mars* takes us on a surreally entertaining trip into the science of life in space and space on Earth.

See <http://www.calacademy.org/events/lectures/#032311> for more information.

continued page 5



## Calendar of Events (continued)

### April 13, Noon - 1:00 pm

What: Mars Odyssey measurements of radiation at Mars  
Who: Cary Zeitlin, SWRI  
Where: SETI Headquarters, 189 N. Bernardo Ave.,  
Mountainview  
Cost: Free

Space radiation poses significant risks to human explorers on extended missions beyond Low-Earth Orbit. Crews cannot be fully shielded against Galactic Cosmic Rays owing to their high energies, and sporadic but intense Solar Particle Events may also be hazardous when shielding is minimal. The physics underlying the transport of these particles through matter is reasonably well understood, but the biological response has large uncertainties. In this talk I will give an overview of these risks and describe NASA's ongoing program to mitigate them.

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

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

What: Origins of the giant planets, their regular satellites and rings: Latest findings and the way forward  
Who: Ignacio Mosqueira, SETI Institute  
Where: SETI Headquarters, 189 N. Bernardo Ave.,  
Mountainview  
Cost: Free

The formation of the regular satellites of giant planets mirrors in profound ways the physical processes leading to the formation of the parent planetary bodies and provides an independent probe of the early history of the solar system. Ongoing results from the Cassini spacecraft are radically changing this field. Dr. Mosqueira will briefly describe combined Jupiter-Saturn models of satellite formation in disks of dust and gas, emphasizing exchange mechanisms taking place between the solar nebula and the subnebulae of the giant planets. He will take us on a tour of the Kronian system starting with captured Phoebe, moving on to home-grown Iapetus, Hyperion and Titan and ending with the close-in moons and rings. Dr. Mosqueira will focus on the implications of Cassini observations for the origins of the rings, moons and planets of the solar system.

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

### April 21, 7:00-8:30pm

What: A Scientist Looks at "Doomsday 2012" & The Rise of Cosmophobia  
Who: David Morrison, Ph.D., NASA AMES  
Where: Foothill College, Smithwick Theater, El Monte  
Road and Freeway 280, in Los Altos Hills, CA  
Cost: Free, \$2 parking (bring change for meters)

Many people have heard the rumors through the media, on the Internet, seeing the big-budget movie, or from friends that the world will end in 2012--and that some astronomical event or alignment is to blame. According to some versions, this "doomsday" scenario was predicted by ancient civilizations and we are just waking up to "the truth." Is there scientific basis to these rumors? Dr. Morrison runs Ask an Astrobiologist, a Web site through which the public can ask NASA questions about life in the universe, and for the past two years he has found himself overwhelmed by questions on the "2012 doomsday" topic. He has now tracked down many of the stories that gave rise to a new fear of the heavens--what he calls "cosmophobia". At the April 21 lecture, he will discuss the scientific perspective on the chances that we won't be around after 2012. There are lessons here about the way a scientifically unsophisticated segment of the public can be manipulated by hoaxers out to make a buck by frightening people.

See: <http://www.foothill.edu/news/newsfmt.php?words=astronomy> for more information, or call (650) 949-7888.

## What's Up by Ken Sperber (adapted from The Year in Space)

All times Pacific Daylight Time, unless otherwise noted.

### March

- 13-28 Sun- Best opportunity of the year to see Mercury, which passes to the right of Jupiter on 13-16( dusk)
- 19 Sat Full Moon (10:10am)
- 20 Sun Spring Equinox (4:21pm)
- 22 Tue Mercury at greatest elongation
- 26 Sat Last-Quarter Moon (5:07am)
- 28 Mon Vesta 1.2 degrees south of the Moon
- 30 Wed Neptune 5 degrees south of the Moon; Mercury appears stationary
- 31 Thur Venus 6 degrees south of the Moon

### April

- 3 Sun New Moon (7:32am); Saturn at opposition
- 6 Wed Jupiter in conjunction with the Sun
- 9 Sat Pluto appears stationary; Mercury at inferior conjunction
- 11 Mon First-Quarter Moon (5:05am)
- 17 Sun Full Moon (7:44pm)



## Thank Goodness the Sun is Single

By Trudy E. Bell

It's a good thing the Sun is single. According to new research, Sun-like stars in close double-star systems "can be okay for a few billion years—but then they go bad," says Jeremy Drake of the Harvard-Smithsonian Astrophysical Observatory in Cambridge, Mass.

How bad? According to data from NASA's Spitzer Space Telescope, close binary stars can destroy their planets along with any life. Drake and four colleagues reported the results in the September 10, 2010, issue of *The Astrophysical Journal Letters*.

Our Sun, about 864,000 miles across, rotates on its axis once in 24.5 days. "Three billion years ago, roughly when bacteria evolved on Earth, the Sun rotated in only 5 days," explains Drake. Its rotation rate has been gradually slowing because the solar wind gets tangled up in the solar magnetic field, and acts as a brake.

But some sun-like stars occur in close pairs only a few million miles apart. That's only about five times the diameter of each star—so close the stars are gravitationally distorted. They are actually elongated toward each other. They also interact tidally, keeping just one face toward the other, as the Moon does toward Earth.

Such a close binary is "a built-in time bomb," Drake declares. The continuous loss of mass from the two stars via solar wind carries away some of the double-star system's angular momentum, causing the two stars to spiral inward toward each other, orbiting faster and faster as the distance shrinks. When each star's rotation period on its axis is the same as its orbital period around the other, the pair effectively rotates as a single body in just 3 or 4 days.

Then, watch out! Such fast spinning intensifies the magnetic dynamo inside each star. The stars "generate bigger, stronger 'star spots' 5 to 10 percent the size of the star—so big they can be detected from Earth," Drake says. "The stars also interact magnetically very violently, shooting out monster flares."

Worst of all, the decreasing distance between the two stars "changes the gravitational resonances of the planetary system," Drake continued, destabilizing the orbits of any planets circling the pair. Planets may so strongly perturbed they are sent into collision paths. As they repeatedly slam into each other, they shatter into red-hot asteroid-sized bodies, killing any life. In as short as a century, the repeated collisions pulverize the planets into a ring of warm dust.

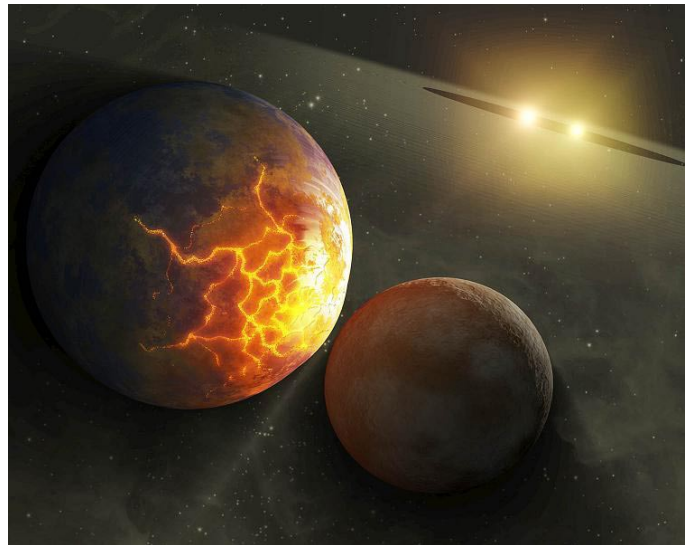
The infrared glow from this pulverized debris is what Spitzer has seen in some self-destructing star systems. Drake and his colleagues now want to examine a much bigger sample of

binaries to see just how bad double star systems really are.

They're already sure of one thing: "We're glad the Sun is single!"

Read more about these findings at the NASA Spitzer site at [www.spitzer.caltech.edu/news/1182-ssc2010-07-Pulverized-Planet-Dust-May-Lie-Around-Double-Stars](http://www.spitzer.caltech.edu/news/1182-ssc2010-07-Pulverized-Planet-Dust-May-Lie-Around-Double-Stars). For kids, the Spitzer Concentration game shows a big collection of memorable (if you're good at the game) images from the Spitzer Space Telescope. Visit [spaceplace.nasa.gov/en/kids/spitzer/concentration/](http://spaceplace.nasa.gov/en/kids/spitzer/concentration/).

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



Caption: Artist's rendering: Planetary collisions such as shown in this artist's rendering could be quite common in binary star systems where the stars are very close.

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.