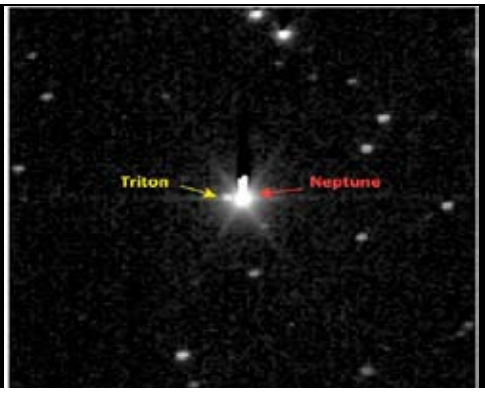
# PRIMEFOCUS

Tri-Valley Stargazers




July 2010

Meeting Info
What:

Summer Barbeque

Who:

TVS Members

When:
July 16, 2010
Set-up at 6:30 p.m.
Dinner at 7:00 p.m.

Where:
Unitarian Universalist
Church in Livermore
1893 N. Vasco Road

Inside



## July Meeting

### Summer BBQ

Our July 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.

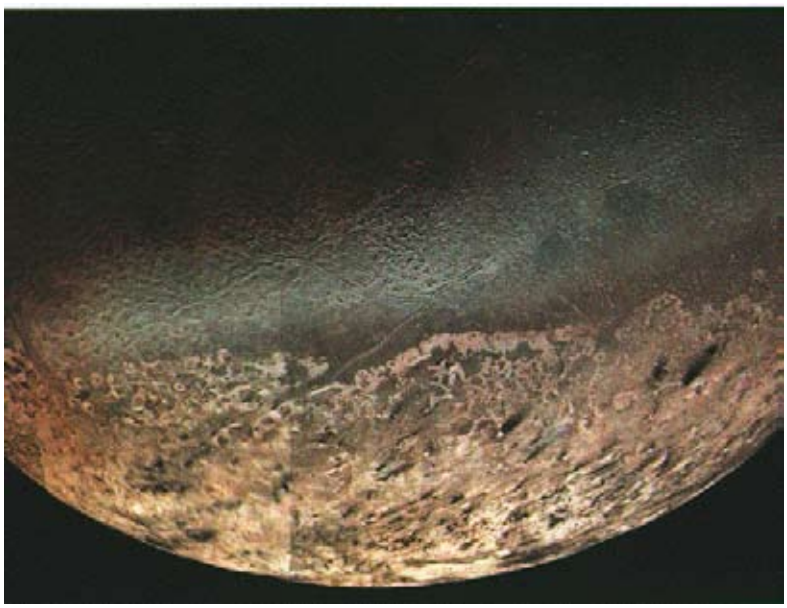


Image of Triton, the largest moon of Neptune, taken by Voyager 2 in 1989. See the Journal Club article on p.2 for information on the composition of Triton's atmosphere. Image Credit: NASA.

# News & Notes

## 2010 TVS Meeting Dates

The following lists the TVS meeting dates for 2010. 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 |
|---|---|---|
| July 16 | July 19 | June 25 |
| Aug. 20 | Aug. 23 | July 31 |
| Sept. 17 | Sept. 20 | Aug. 28 |
| Oct. 15 | Oct. 18 | |
| Nov. 19 | Nov. 22 | |
| Dec. 17 | Dec. 20 | |

## Money Matters

Treasurer David Feindel indicates that as of the May 17, 2010 the TVS account balances are:

| | | |
|---|---|---|
| Checking | $5,130.32 | |
| CD #1 | $3,761.41 | rolled over 5/17/2010 |
| CD #2 | $2,654.36 | rolled over 2/27/2010 |

## TVS Volunteers Needed

We still need a volunteer to take on the duties of the club Secretary. We also could use more members on the Board of Directors. If you wish to help with any of these positions, please contact any officer or board member.

## Scopes Needed at the Pleasanton Library-July 21st

TVS has been asked to help with a star party at the Pleasanton Library on Wednesday, July 21st. The Chabot Space & Science Center will be doing a presentation first, followed by us with our scopes. If you'd like to help out, please contact Wayne Miller at artzncrafts ~at~ comcast ~dot~ net so that he can get a count as to the number of scopes.

## White Mountain/Barcroft Dates Announced-September 4-12

The dates for the annual White Mountain High Altitude Star Party are September 4th through the 12th. Price will most likely be $65/night, which includes meals, bunk bed, indoor plumbing, and very dark sky sites. You don't need to stay for the entire duration; you're free to choose which days you want to be there.

Attendees must be over the age of 16 due to the altitude (12,400'). Dave Rodrigues is the coordinator for this star party. You may reach him at 510- 483- 9191 if you would like to sign up or get more information.

# Journal Club by Ken Sperber

## Methane and Carbon Monoxide on Triton

What do Earth, Titan, Triton, and Pluto have in common? If you guessed that the dominant component of their atmospheres is molecular nitrogen ($N_2$) you'd be correct! Frozen nitrogen is believed to be the dominant ice on the surface of Triton, followed by frozen methane ($CH_4$) and frozen carbon monoxide (CO). These ices are volatile and thus they sublimate to form a tenuous atmosphere. Given that Triton orbits Neptune in a retrograde orbit, it is believed to be a captured Kuiper Belt object. Additionally, it has a composition similar to Pluto, which is classified as a Kuiper Belt Object.

As you might expect, given its distance from Earth, few observations of Triton have been made. In 1989 Voyager 2 discovered $CH_4$ in Triton's atmosphere, and only recently has Lelloch et al. (2010) discovered CO in its atmosphere. This discovery, and updated measurements of the atmospheric concentration of $CH_4$, was made with the European Southern Observatory Very Large Telescope (8.2m diameter primary mirror) using adaptive optics and the Cryogenic High-Resolution Infrared Echelle Spectrograph (CRIRES). The Earth's atmosphere also contains $N_2$, $CH_4$, and CO in much higher abundance, so you might ask how is it possible to measure much lower concentrations on a distant moon of Neptune. Fortunately, the relative velocity between Earth and Neptune is about 23km $s^{-1}$, which is substantial enough to cause a Doppler shift of the absorption lines measured at Triton as compared to their Earthly counterparts. Using a detailed radiative transfer model the authors estimate the partial pressure of $CH_4$ on Triton to be 9.8 +/- 3.7 nbar (1 bar is the surface pressure on Earth, and 1 nanobar is $10^{-9}$bar). This partial pressure is about 5 times larger than the estimate obtained from Voyager 2 data, and is consistent with the change of season at Triton. When Voyager 2 observed at Triton it was late spring, while the 2010 ESO observations were made during summer on Triton (given that Neptune orbits the Sun once every 165 Earth years, each season lasts more than 40 Earth years). Thus, even though Neptune and Triton are about 30 times further from the Sun than Earth, the change of season is enough to warm the surface of Triton and cause more of the surface ice to sublimate and increase the atmospheric pressure. The radiative transfer model also predicts the temperature of Triton to be about 50K, much colder than that of Pluto (90K), consistent with the higher

Newsletter header image: On its' way to Pluto, the New Horizons Spacecraft photographed Neptune and Triton on October 16, 2008 from a distance of 3.75 billion km using the Long Range Reconnaissance Imager.

For more information see http://pluto.jhuapl.edu/news_center/news/031209.php and http://www.universetoday.com/2009/03/12/new-horizons-spots-neptunes-moon-triton/

Image Credit: NASA/Johns Hopkins University Applied Physics Laboratory/Southwest Research Institute.

concentration of $CH_4$ on Pluto, since $CH_4$ is a powerful greenhouse gas.

The amount of CO on Triton was more difficult to estimate since the individual spectral lines of CO are very narrow. By assuming a uniform vertical abundance of CO and using numerous CO spectral lines the authors estimate the partial pressure of CO to be 24nbar, with a factor of 3 uncertainty. The atmospheric abundance of CO "appears to be controlled by a thin, CO-enriched, surface veneer resulting from seasonal transport and/or atmospheric escape. The authors also searched for CO on Pluto during the same observing session, but were only able to assign an upper limit. The New Horizons mission, scheduled to arrive at Pluto in 2017, will provide detailed information about the atmospheric and surface composition of Pluto.

For more information see: http://www.universetoday.com/2010/04/07/40-years-of-summer-on-triton/ and Lellouch et al. (2010, Astron. Astrophys., 512: L8; doi:10.1051/0004-6361/201014399)

## Calendar of Events

### July 17, 8:30pm

What: Galileo, Telescopes and the Beginning of Modern Science
Who: John Dillon, Randall Museum-San Francisco
Where: Mt. Tamalpais State Park, Cushing Memorial Amphitheater, more commonly known as the Mountain Theater, Rock Spring parking area
Cost: Free

Review of the history of science and an exploration of the subtle, complex relationship between Galileo, telescopes, Science and the Church.

### July 21, 12:00 - 1:00 pm

What: From Hot Jupiters to Super-Earths: A Survey of Exoplanetary Atmospheres
Who: Heather Knutson, Department of Astronomy, UC Berkeley
Where: SETI in Mountain View
Cost: Free

The past decade has marked a period of great progress in our quest to discover and characterize the properties of the planets outside of our own solar system. Observations of transiting systems, in which the planet periodically passes in front of and then behind its star as seen from the earth, have allowed us to study the properties of these distant worlds in unprecedented detail. Dr. Knutson will describe some of our initial measurements of the close-in, gas giant planets known as hot Jupiters, and discuss how these same techniques might be applied to smaller and more earth-like worlds.

This lunchtime talk is part of the SETI Institute Colloquium Series. Location is 515 N. Whisman Road, Mountain View, CA 94043. For more info, visit their web site http://www.seti.org/csc/lectures, e-mail info@seti.org, or phone 650-961-6633.

### July 23-24, 7:00pm-10:00 am

What: Slumber with the Stars
Who: Ages 5 and up
Where: Chabot Space & Science Center
Cost: Advanced Reservations Required: $75 members/$85 guests

Spend a night under the stars or with some really cool exhib-

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**Officers**

**President:**
Chuck Grant
cg@fx4m.com
925-422-7278

**Vice-President:**
unfilled

**Treasurer:**
David Feindel
feindel1@comcast.net

**Secretary:**
unfilled

**Volunteer Positions**

**Librarian:**
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**Newsletter Editor:**
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**Program Director:**
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**Loaner Scope Manager:**
John Swenson
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**Webmaster:**
Wayne Miller

**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

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.

**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) asking to join the group. Make sure you specify the e-mail address you want to use to read and post to the group.

its. Join us for Slumber with the Stars, Chabot's newest family night out. An overnight in our Center that includes games, exhibit exploration, hike in the Redwoods, a live planetarium show and viewing through our renowned, large telescopes. An experience your family will remember for a lifetime.

A minimum of 1 adult for every 5 kids is required.

The Chabot Space and Science Center is located at 10000 Skyline Blvd, Oakland. For more info, visit their web site http://chabotspace.org/visit/calendar/default.aspx?date=7/23/2010#calendar or call (510) 336-7373.

### July 28, 12:00 - 1:00 pm

What: Exploring Mars for Evidence of Habitable Environments and Life
Who: Dave Des Marais, NASA Ames Research Center
Where: SETI in Mountain View
Cost: Free

Recent Mars missions have discovered fascinating landscapes as well as chemicals and minerals formed by the action of liquid water. Mars could have been habitable sometime in the past, and liquid water might persist in some subsurface environments today. Dr. Dave Des Marais, Chair of the Mars Exploration Program Advisory Group (MEPAG), will discuss recent discoveries that are helping to identify the most promising places to search for evidence of life.

This lunchtime talk is part of the SETI Institute Colloquium Series. Location is 515 N. Whisman Road, Mountain View, CA 94043. For more info, visit their web site http://www.seti.org/csc/lectures, e-mail info@seti.org, or phone 650-961-6633.

### August 2, 7:30 pm

What: Lunar Impact! NASA's LCROSS Mission
Who: Dr. Jennifer Heldmann, NASA Ames Research Center
Where: California Academy of Science, 55 Music Concourse Dr., Golden Gate Park, San Francisco, CA 94118
Cost: Adults $12, Seniors $10, Academy members $6. Seating is limited.

Our nearest celestial neighbor is our Moon which harbors many secrets in planetary science. The LCROSS (Lunar Crater Observation and Sensing Satellite) mission's objectives were to study a permanently shadowed region near a pole of the Moon. Science goals included investigating the presence or absence of water on the Moon as well as furthering our understanding of other species trapped in these regions. This talk will focus on first science results from the mission, including characterization of the impact plume and detection of water, among other species.

### August 4, 12:00 - 1:00 pm

What: Titan Unveiled
Who: Ralph Lorenz, Applied Physics Laboratory
Where: SETI in Mountain View
Cost: Free

Saturn's giant moon Titan has been of considerable interest since the presence of an atmosphere was hinted at one century ago. The NASA-ESA-ASI Cassini-Huygens mission, at Saturn for the last 4 years, has transformed this curious dot in the sky into a remarkably diverse, complex and interesting world, which is in many ways more Earth-like than anywhere in the solar system. This talk will summarize some of Cassini's recent findings with emphasis on the interactions between Titan's surface, atmosphere, and interior. These include dune-covered sand seas, river channels that attest to violent but perhaps rare downpours and climate change, hydrocarbon lakes and possible cryovolcanic features. The rich inventory of organics on Titan makes it a particularly appealing target for astrobiological studies.

Titan's thick atmosphere and low gravity permit a wide range of exploration vehicle types, notably aircraft and balloons. The scientific goals and technical features of vehicles and instruments for future exploration of Titan, will be discussed.

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### August 13-15

What: SETIcon: Science Meets Sci-Fi
Who: Scientists, Astronauts, TV Personalities, etc.
Where: Hyatt Regency Hotel in Santa Clara
Cost: See below and http://www.seticon.com/

Make contact with other fans at SETIcon: The Search for Life in the Universe in Science Fact & Science Fiction. Science and the imagination meet Friday through Sunday, Aug. 13–15, at the Hyatt Regency Hotel in Santa Clara. The convention is presented by Mountain View-based SETI, the Search for Extraterrestrial Intelligence. At SETIcon, you'll enjoy a wide range of mind-expanding activities, an evening gala, lots of time for discussion, plus a banquet where you can rub elbows with the speakers and other enthusiasts. The SETIcon banquet will honor Dr. Frank Drake on the occasion of the 50th anniversary of the first search for radio signals from extraterrestrial civilizations.

Confirmed guests include Frank Drake-who undertook the first SETI program, Jill Tarter-the SETI scientist on whom Jodi Foster's Contact character was based, Astronaut Rusty Schweickart, SETI Scientist Seth Shostak, planet hunters Michael Brown and Debra Fischer, Alex Filippenko of UC Berkeley, Tim Russ-Star Trek's Tuvok, and many others.

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Admission is $20 per day; $35, for a weekend pass. Discounted admission is available for students, age 15 and older, who present an identification card. Children under age 14 are admitted free with one paid SETIcon adult ticket. Banquet reservations begin at $150, and sponsorship opportunities are available. SETIcon benefits the non-profit SETI Institute, and its programs in science and education. To purchase tickets or for more information, access www.seticon.com.

### August 14, 8:30pm

What: The Many Mysteries of Antimatter
Who: Dr. Helen Quinn, SLAC-Stanford University
Where: Mt. Tamalpais State Park, Cushing Memorial Amphitheater, more commonly known as the Mountain Theater, Rock Spring parking area
Cost: Free

Review of the history of science and an exploration of the How and when the imbalance of matter over antimatter developed is one of the great mysteries to unravel to understand the underlying properties of the universe.

### August 18, 12:00 - 1:00 pm

What: From Earth to the Stars: Psychological Issues during Space Missions
Who: Nick Kanas, Professor of Psychiatry, UCSF
Where: SETI in Mountain View
Cost: Free

Recent studies on-orbit have provided information on important psychological and interpersonal issues that affect crewmembers and mission control personnel who are involved with near-Earth space missions. However, the extreme distances, communication delays, and increased crewmember autonomy that will characterize missions to Mars and beyond will introduce additional psychosocial stressors never before experienced. Professor Kanas will discuss these stressors and their impact on people traveling to the outer solar system and nearby stars, including those resulting from new technologies, such as traveling at a significant fraction of the speed of light, putting crewmembers in suspended animation, or creating giant self-contained generation ships of colonists who will not return to Earth. Professor Kanas is the author of two books: Space Psychology and Psychiatry and Star Maps: History, Artistry, and Cartography.

This lunchtime talk is part of the SETI Institute Colloquium Series. Location is 515 N. Whisman Road, Mountain View, CA 94043. For more info, visit their web site http://www.seti.org/csc/lectures, e-mail info@seti.org, or phone 650-961-6633.

## What's Up (adapted from Sky and Telescope)

All times Pacific Daylight unless otherwise noted.

### July

| | | |
|---|---|---|
| 18 | Sun | First-Quarter Moon (3:11am) |
| 21 | Wed | Moon is about 5 degrees east of Antares |
| 25 | Sun | Full Moon (6:37pm) |
| 27 | Tue | Regulus and Mercury are within 1 degree of each other in the lower west (Dusk) |
| 29-30 | Thur- | Saturn and Mars are within 2 degrees of each other |

### August

| | | |
|---|---|---|
| 2 | Mon | Last-Quarter Moon (9:59pm) |
| 4 | Wed | The Pleiades (M45) are about 3 degrees to the lower-left of the waning crescent Moon (4am-ish) |
| 6-8 | Fri- | Venus, Mars, and Saturn are within 5 degrees of each other in the western sky (Dusk) |
| 9 | Mon | New Moon (8:08pm) |
| 11-12 | Wed- | Perseid Meteor Shower peaks on these two nights with Zenithal Hourly Rate of 100-150 meteors possible (best after midnight) |
| 13 | Fri | Quadruplet conjunction of the Moon, Venus, Mars, and Saturn in the west (after sunset) |
| 16 | Mon | First-Quarter Moon (11:14am) |
| 19-20 | Thur- | Neptune is at opposition (visible all night; see www.SkyandTelescope.com/neptune for a chart) |
| 24 | Tue | Full Moon (10:05am) |
| 26-27 | Thur- | The Moon is within 6 (12) degrees of Jupiter on the 26th (27th) (Late evening) |
| 31 | Tue | The Pleiades (M45) are about 6 degrees to the left of the waning gibbous Moon (4am-ish) |
| 31 | Tue | Spica is 1 degree away from Venus (dusk) |

## Black Holes No Joke

by Dr. Tony Phillips

*Kip Thorne: Why was the black hole hungry?*

*Stephen Hawking: It had a light breakfast!*

Black hole humor—you gotta love it. Unless you're an astronomer, that is. Black holes are among the most mysterious and influential objects in the cosmos, yet astronomers cannot see into them, frustrating their attempts to make progress in fields ranging from extreme gravity to cosmic evolution.

How do you observe an object that eats light for breakfast?

"Black holes are creatures of gravity," says physicist Marco Cavaglia of the University of Mississippi. "So we have to use gravitational waves to explore them."

Enter LIGO—the NSF-funded Laser Interferometer Gravitational-wave Observatory. According to Einstein's Theory of General Relativity, black holes and other massive objects can emit gravitational waves—ripples in the fabric of space-time that travel through the cosmos. LIGO was founded in the 1990s with stations in Washington state and Louisiana to detect these waves as they pass by Earth.

"The principle is simple," says Cavaglia, a member of the LIGO team. "Each LIGO detector is an L-shaped ultra-high vacuum system with arms four kilometers long. We use lasers to precisely measure changes in the length of the arms, which stretch or contract when a gravitational wave passes by."

Laser Interferometer Gravitational-wave Observatory in Livingston, Louisiana. Each of the two arms is 4 kilometers long. LIGO has another such observatory in Hanford, Washington.

Just one problem: Gravitational waves are so weak, they change the length of each detector by just 0.001 times the width of a proton! "It is a difficult measurement," allows Cavaglia.

Seismic activity, thunderstorms, ocean waves, even a truck driving by the observatory can overwhelm the effect of a genuine gravitational wave. Figuring out how to isolate LIGO from so much terrestrial noise has been a major undertaking, but after years of work the LIGO team has done it. Since 2006, LIGO has been ready to detect gravitational waves coming from spinning black holes, supernovas, and colliding neutron stars anywhere within about 30 million light years of Earth.

So far the results are … nil. Researchers working at dozens of collaborating institutions have yet to report a definite detection.

Does this mean Einstein was wrong? Cavaglia doesn't think so. "Einstein was probably right, as usual," he says. "We just need more sensitivity. Right now LIGO can only detect events in our little corner of the Universe. To succeed, LIGO needs to expand its range."

So, later this year LIGO will be shut down so researchers can begin work on Advanced LIGO—a next generation detector 10 times more sensitive than its predecessor. "We'll be monitoring a volume of space a thousand times greater than before," says Cavaglia. "This will transform LIGO into a real observational tool."

When Advanced LIGO is completed in 2014 or so, the inner workings of black holes could finally be revealed. The punchline may yet make astronomers smile.

Find out more about LIGO at http://www.ligo.caltech.edu/ and http://imagine.gsfc.nasa.gov/docs/features/topics/gwaves/gwaves.html. The Space Place has a LIGO explanation for kids (of all ages) at http://spaceplace.nasa.gov/en/kids/ligo, where you can "hear" a star and a black hole colliding!

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

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.