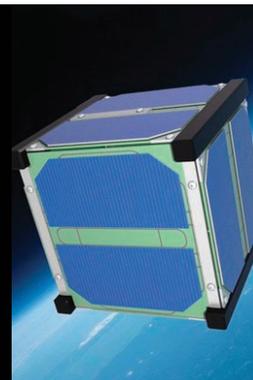


PRIMEFOCUS

Tri-Valley Stargazers



January 2013



Meeting Info

What:

SkyCube: The First Satellite Launched by You!

Who:

Tim DeBenedictis

When:

January 18, 2013
Doors open at 7:00 p.m.
Show & Tell at 7:30 p.m.

Featured Speaker at 8:00 p.m.

Where:

Unitarian Universalist
Church in Livermore
1893 N. Vasco Road

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NASA's Space Place	7
Membership/Renewal Application	8

January Meeting

SkyCube: The First Satellite Launched by You!

Tim DeBenedictis

Tim DeBenedictis, the CEO of Southern Stars (e.g., Sky Safari), will talk about SkyCube, "a nano-satellite that lets you take Earth images and 'tweet' from space, then inflates a visible balloon, and de-orbits cleanly." Nearly \$120,000 has been raised to bring the project to fruition. SkyCube will broadcast sponsor messages, and take pictures from orbit that will be sent to sponsors' cell phones. For more information, see: <http://www.kickstarter.com/projects/880837561/skycube-the-first-satellite-launched-by-you> and <http://abcnews.go.com/Business/cheap-space-satellites/story?id=17165740#.UEIFQEIsq6E>

Tim DeBenedictis has been writing astronomy software since his high school days. After graduating from MIT in 1993 with a degree in Earth, Atmospheric, and Planetary science, Tim found himself in Silicon Valley when the internet boom began. He held engineering positions at several financial services and technology companies throughout the dot-com boom, and returned to his "astronomical roots" after the bust. Tim was also one of the two principal designers behind the award-winning SkySafari iPhone app and SkyFi wireless controller. Tim currently resides in San Francisco, California. In his spare time, he enjoys cycling, backpacking, skiing, and sailing on the San Francisco bay.

Dues Are Due

TVS' membership year runs from January to December, so now is the time to renew your membership. Our membership rates remain unchanged from last year, as do the subscription rates for Astronomy and Sky & Telescope. We no longer offer the "Regular" membership level since we do not send out printed copies of the newsletter. Rather, at the "Basic" membership level we contact you via e-mail to let you know that a .pdf of the newsletter is available. The renewal form can be found on the back of this newsletter or on our website under the Membership link.

Royal Astronomical Society of Canada (RASC) Handbooks and Calendars Available for Purchase

The club now has RASC Handbooks and Calendars available for purchase. According to the website <http://www.nova-astro.com/handbook/> the 2013 edition of the handbook is bundled with the *Earth Centered Universe* Planetarium Software (<http://www.nova-astro.com/handbook/2013.html>). This free software will function through March 31, 2014 and will not perform predictions for events later than December 31, 2014. Prices are the same as last year: \$25 for the Handbook and \$17 for the Calendar. See David Feindel for purchases, or contact him via e-mail (feindel@comcast.net) to arrange to pick up Handbooks and/or Calendars if you can't attend the meeting. For more information on the handbook and calendar, see <http://www.rasc.ca/handbook/> and <http://www.rasc.ca/calendar>

News & Notes

2013 TVS Meeting Dates

The following lists the TVS meeting dates for 2013. 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
Jan. 18	Jan. 22	
Feb. 15	Feb. 18	Jan. 25
Mar. 15	Mar. 18	Feb. 22
Apr. 19	Apr. 22	Mar. 29
May 17	May 20	Apr. 26
Jun. 21	Jun. 24	May 24
Jul. 19	Jul. 22	Jun. 28
Aug. 16	Aug. 19	Jul. 26
Sep. 20	Sep. 23	Aug. 30
Oct. 18	Oct. 21	Sep. 27
Nov. 15	Nov. 18	Oct. 25
Dec. 20	Dec. 23	Nov. 29

Money Matters

Treasurer David Feindel indicates that as of November 16, 2012 the TVS account balance is:

Checking \$11,857.26

Journal Club by Ken Sperber and Karen Harris

Now and Then (Part 2)

In the December 2012 issue of PrimeFocus we gave brief histories of observatories that we visited in recent years. This month's column looks forward, describing some of the "cutting-edge" research that is ongoing at these observatories, and plans for new instruments and observing capabilities.

Melbourne Observatory, Australia – 1869

The Melbourne Observatory is an educational facility. Guided tours of the various telescopes include insightful descriptions of the history of the observatory and its instruments. The docents are members of The Astronomical Society of Victoria. Of particular interest (and great beauty) is the Photoheliograph that was installed for the 1874 solar transit of Venus. This instrument was constructed by J. H. Dallmeyer of London, costing the Colony of Victoria 374 English pounds in 1874. The photoheliograph was in use until 1962, whereafter it languished in the suburban home of its purchaser. It was restored and installed in the present dome in time for the Venus transit of 2004!

James Lick Observatory, Mt. Hamilton, CA - 1888

Despite the light pollution of the Bay area, Lick Observatory

remains at the forefront of select areas of research. Ongoing efforts include the search for extrasolar planets, and the search for Supernovae with the Katzman Automatic Imaging Telescope. Last year the effort paid off with the discovery of 7 Supernovae, including Type 1a events that are useful for assessing the accelerating expansion of the universe. As recently as 2000, the 36-inch refractor was used to photograph star clusters in the Milky Way. These images were compared with images taken in the 1970's. These two sets of images were then compared to examine the proper motion of the stars, and determine which field stars actually belong to a given cluster.

Prof. Sandra Faber, the Director of the University of California Observatories, was 1 of 12 recipients awarded the National Medal of Science in December 2012. This is the highest award the US government bestows on scientists.

For more information see: <http://www.ucolick.org/research.html> and <http://mthamilton.ucolick.org/public/research/>

Griffith Observatory, Mt. Hollywood, CA – 1935



Caption: Griffith Observatory, September 10, 2011. Credit: Karen Harris

Griffith Observatory is the Southland's version of Chabot Space and Science Center. In 2006 the Griffith Observatory reopened after nearly 5 years of restoration. Admission to the Observatory and its grounds is free, with the facility being open Wednesday through Sunday. Public viewing through the telescope is available nightly (weather permitting). Check out the shows at the Samuel Oschin Planetarium and the Leonard Nimoy Event Horizon Theater, and don't forget to take in the beautiful view of downtown Los Angeles.

Palomar Observatory, San Diego, CA – 1948/1949

The 200-inch Hale telescope is equipped with a visible to near-IR (0.3 - 2.5 microns) spectrograph. Ongoing projects include the study of Gamma-Ray burst afterglows, quasars,

Header Image: SkyCube Graphic. Credit: Tim DeBenedictis

Journal Club (continued)

primeval galaxies, Type 1a Supernovae, stellar populations, brown dwarfs, and solar system objects. The 48-inch Oschin robotic telescope of the Palomar Transient Factory has revolutionized the detection of exotic variable stars, including the detection of nearly 1900 Supernovae since December 2008. Caltech, the management body of Palomar Observatory is also involved in the development of the Thirty Meter Telescope, and will contribute to "the design and construction of the telescope, AO systems, and science instruments."

For more information see: http://www.astro.caltech.edu/research/future_projects.html and http://en.wikipedia.org/wiki/Palomar_Transient_Factory

Kitt Peak National Observatory, Tucson, AZ – 1958

The Mayall 4m telescope at Kitt Peak will be equipped with a new multi-object spectrograph (MOS), KOSMOS. This instrument is based on the Ohio State MOS. Some of the requirements for this instrument include 0.3 arc sec/pixel resolution and 400-1000nm wavelength coverage. A second copy of this instrument, COSMOS, will be deployed at Cerro Tololo Interamerican Observatory. BigBOSS, also designed for the Mayall 4m telescope, is the Big Baryon Oscillation Spectroscopic Survey. This instrument will have a 3 degree field of view, with a bank of 5000 positionable optical fibers that will be used to obtain visible light spectra of up to 5000 objects at once. The goal is "to collect up to 20 million galaxy spectra to further constrain the nature of Dark Energy." Science commissioning is in progress on ODI, the one-degree imager, which is used on the WIYN telescope. ODI is a 1 gigapixel camera that employs an Orthogonal Transfer Array that "will be able to compensate for image motion due to atmospheric turbulence, telescope shake, and tracking errors by locally shifting the image directly within the CCD."

For more information see: <http://ast.noao.edu/system/future> <http://ast.noao.edu/facilities/kpno> http://www.noao.edu/nstc/kosmos/Documents/KOSMOS_SRD_V1_4.pdf and <http://www.noao.edu/wiyn/ODI/>

Mauna Kea Observatories, Hawai'i – 1968

Pan-STARRS-1 is located at Haleakala on Maui, as will be Pan-STARRS-2, which is scheduled for first light in 2013. Pan-STARRS-4 (I don't know what happened to PS3) is targeted for Mauna Kea, as a replacement of the University of Hawaii 2.2m telescope (the first telescope put atop Mauna Kea). PS4 will have a smaller "footprint" than the 2.2m telescope, with the housing designed to blend into the landscape. Replacement of outdated structures (rather than new additions), and design that integrates into the surroundings shows sensitivity to the cultural importance that native Hawaiians have for Mauna Kea. An environmental impact study is currently being prepared as part of the approval process for PS4.

Mauna Kea is also the proposed home of the Thirty Meter Telescope. In late November 2012, a hearing officer recommended that a Conservation Use District Permit be issued as part of the approval process to begin construction. In the interim, the proponents of the project and the dissenters have developed responses to the hearing officer's report. They will be back in Hawaii County Council chambers on January 30 to present their exceptions to the report and respond to each other's court briefs. Both sides have indicated that if they do not prevail when the Department of Land and Natural Resources issues its ruling, they will appeal the decision to the 3rd Circuit Court. As such, construction of the TMT at Mauna Kea remains uncertain.

For more information see: <http://pan-starrs.ifa.hawaii.edu/>

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Eyes on the Skies

Eyes on the Skies is a robotic solar telescope run by Mike Rushford (rushford@eyes-on-the-skies.org). 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.

Journal Club (continued)

public/ <http://www.tmt.org/> and <http://hawaii.tribune-herald.com/sections/news/local-news/report-backs-tmt-project.html>

Karen and I are looking forward to visiting more “cathedrals of the night,” and perhaps one day we will build one of our own (on a smaller scale-of course)!

Calendar of Events

January 15, 7:00pm

What: The Sentinel B612 Telescope - Finding Asteroids Before They Find Us
Who: Ed Lu
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

We know how to deflect asteroids, but our technology is useless if we do not scan the skies to look for asteroids to know well in advance if one is on a collision course with Earth. The Sentinel Space Telescope, the first privately supported deep space mission, is designed to do just that and to enable humanity to protect our planet from future asteroid impacts. Sentinel is an infrared space telescope to be placed into solar orbit in 2017 from where it will find and track asteroids that threaten Earth. It will discover more asteroids each month than the total discovered by all other telescopes combined up until the present. In addition to becoming one of humanity's great scientific instruments, Sentinel will be unique in that its main purpose is actually to protect the Earth.

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

January 22, Noon-1:00pm

What: What Can Black Hole Dynamics Tell Us About Quantum Gravity?
Who: Steven Carlip, UCSD
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

Forty years ago, Jacob Bekenstein and Stephen Hawking showed that black holes are “hot,” with characteristic temperatures and entropies that depend on properties of their event horizons. The Hawking temperature and the Bekenstein-Hawking entropy are quantum and gravitational -- they depend on both Planck's constant and Newton's gravitational constant -- and, in fact, they provide one of the very few pieces of information about quantum gravity that we really believe with any confidence. Black hole thermodynamics hints at intriguing features of quantum gravity, such as “holography,” the possibility that the fundamental physical

properties of a finite region might be entirely described by quantum states at its boundary. But black hole thermodynamics is also surprisingly universal: that is, there seem to be many different approaches to quantum gravity that all give the same answers. In this talk, I will discuss the open question of what, if anything, we can learn about the fundamental properties of quantum gravity by studying black holes.

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

January 25, 5:00pm

What: Moonlight Hike
Who: Guided Hike
Where: Chabot Space and Science Center, 10000 Skyline Blvd. Oakland, CA 94619
Cost: \$10 does NOT include General Admission, Space is Limited. Advanced registration is highly encouraged. Tickets available online or by calling (510) 336-7373

Hike through the redwoods in twilight and moonlight on a moderately strenuous 4-5 mile hike. Trail walks are led by an experienced hiker and Chabot educator and feature discussions about the natural environment and events and objects in the sky. Hike will take place rain or shine.

See <http://www.chabot.space.org/calendar.htm?date=12-9-2011&p=1439357> for more information

January 29, Noon-1:00pm

What: First Results from the ChemMin Mineralogical Instrument on Mars Science Laboratory
Who: David Blake, NASA Ames Research Center
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

Abstract unavailable.

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

February 4, 7:30pm

What: How It All Began
Who: Dr. Christopher Impey, Department of Astronomy, University of Arizona
Where: California Academy of Science, 55 Music Concourse Dr., Golden Gate Park, San Francisco, CA
Cost: Adults \$12, Seniors \$10, Academy members \$8. Reserve a Space Online or call 415-379-8000

Learn about how an iota of space-time 13.7 billion years ago grew into 100 billion galaxies, including everything we know and love. The big bang is the scientific story of creation and it's supported by a web of evidence pointing to an extremely

continued page 5

hot and dense early state for the universe. What if we could look into space and see not only our place in the universe but also how we came to be here? As it happens, we can. Because it takes time for light to travel, we see more and more distant regions of the universe as they were in the successively greater past. Impey uses this concept—"look-back time"—to take us on an intergalactic tour that is simultaneously out in space and back in time. Performing a type of cosmic archaeology, Impey describes the astronomical clues that scientists have used to solve fascinating mysteries about the origins and development of our universe. How It All Began book signing to follow.

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

February 5, Noon-1:00pm

What: Brown Dwarfs, Planetary Mass Objects, and Their Disks in the Nearest Star-Forming Regions
Who: Mary Barsony, SETI Institute
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

Objects with masses (<0.08 solar masses) too small to sustain hydrogen fusion were theorized to exist five decades ago, and discovered 30 years later, due to their extreme faintness. Even less massive (<13 Jupiter or <0.01 solar masses) are the planetary mass objects (PMOs), so-called because they are not orbiting a star.

We have recently discovered large populations of such free-floating PMOs and brown dwarfs in the nearest star-forming regions to Earth, when they are at their brightest and most amenable to detection. Do such objects outnumber the stars in the Galaxy? Do they have their own planetary or moon systems? Could these sustain surface or subsurface liquid water for eons via tidal heating and thus provide environments conducive for the development of microbial life?

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

February 6, 7:00pm

What: How Galaxies were Cooked from the Primordial Soup
Who: Dr. Sandra Faber, UC Santa Cruz
Where: Smithwick Theater, Foothill College, El Monte Road and Freeway 280, Los Altos Hills, CA
Cost: Free, \$3 parking permits must be purchased from dispensers in student lots. Parking Lots 1, 7, and 8 provide stair and no-stair access to the theater. For more information, access www.foothill.edu or call (650) 949-7888.

One of the great mysteries of the night sky is why it's most-

ly dark, only punctuated by pinpoints of light in the form of stars and galaxies. The lumpiness of today's universe is a fundamental characteristic that took billions of years to grow. Dr. Faber will review the prevailing "Cold Dark Matter" theory for galaxy formation and compare its predictions to present-day observations. It's a remarkable saga involving invisible dark energy and matter, the properties of the universe an instant after it was born, cosmic expansion faster than light, and the creation of structure from quantum fluctuations. What's more, she will show that we probably understand this cosmic history better than we understand the origin of our own DNA!

For more information see: http://www.foothill.edu/news/newsfmt.php?sr=2&rec_id=2869

February 12, Noon-1:00pm

What: Spacecraft Autonomy for Next-Generation Space Missions
Who: Marco Pavone, Stanford University
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

Abstract unavailable.

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

What's Up by Ken Sperber (adapted from The Year in Space and S&T)

All times Pacific Standard Time.

January

- 12-13 Sat Mars near the crescent Moon (30-60 minutes after sunset)
- 18 Fri **First Quarter Moon (3:45pm); Mercury at superior conjunction**
- 20 Sun Algol at minimum brightness for ~2 hours centered on 9:48pm
- 21 Mon Jupiter within 1 degree of waxing gibbous Moon (8pm)
- 26 Sat **Full Moon (8:38pm)**
- 27 Sun Vesta appears stationary
- 29-10 Tue- Zodiacal light visible from dark sky locations (80 minutes after sunset)

February

- 3 Sun **Last-Quarter Moon (5:56am)**
- 3 Sun Saturn above the last-quarter Moon (See February S&T. p. 48; predawn/dawn)
- 7-8 Thu- Mars within 1 degree of Mercury in WSW (dusk)
- 9 Sat **New Moon (11:20pm)**
- 10 Sun With binoculars, the crescent Moon might be visible near Mars and Mercury (dusk)
- 11 Mon Mercury to lower-left of the Moon (dusk)
- 12-20 Tue- Mercury at least 10 degrees above the horizon (half-hour after sunset)
- 13 Wed Uranus 4 degrees south of the Moon



Partnering to Solve Saturn's Mysteries

By Diane K. Fisher

From December 2010 through mid-summer 2011, a giant storm raged in Saturn's northern hemisphere. It was clearly visible not only to NASA's Cassini spacecraft orbiting Saturn, but also astronomers here on Earth—even those watching from their back yards. The storm came as a surprise, since it was about 10 years earlier in Saturn's seasonal cycle than expected from observations of similar storms in the past. Saturn's year is about 30 Earth years. Saturn is tilted on its axis (about 27° to Earth's 23°), causing it to have seasons as Earth does.

But even more surprising than the unseasonal storm was the related event that followed.

First, a giant bubble of very warm material broke through the clouds in the region of the now-abated storm, suddenly raising the temperature of Saturn's stratosphere over 150 °F. Accompanying this enormous "burp" was a sudden increase in ethylene gas. It took Cassini's Composite Infrared Spectrometer instrument to detect it.

According to Dr. Scott Edgington, Deputy Project Scientist for Cassini, "Ethylene [C₂H₄] is normally present in only very low concentrations in Saturn's atmosphere and has been very difficult to detect. Although it is a transitional product of the thermochemical processes that normally occur in Saturn's atmosphere, the concentrations detected concurrent with the big 'burp' were 100 times what we would expect."

So what was going on?

Chemical reaction rates vary greatly with the energy available for the process. Saturn's seasonal changes are exaggerated due to the effect of the rings acting as venetian blinds, throwing the northern hemisphere into shade during winter. So when the Sun again reaches the northern hemisphere, the photochemical reactions that take place in the atmosphere can speed up quickly. If not for its rings, Saturn's seasons would vary as predictably as Earth's.

But there may be another cycle going on besides the seasonal one. Computer models are based on expected reaction rates for the temperatures and pressures in Saturn's atmosphere, explains Edgington. However, it is very difficult to validate those models here on Earth. Setting up a lab to replicate conditions on Saturn is not easy!

Also contributing to the apparent mystery is the fact that haze on Saturn often obscures the view of storms below. Only once in a while do storms punch through the hazes. Astronomers may have previously missed large storms, thus failing to notice any non-seasonal patterns.

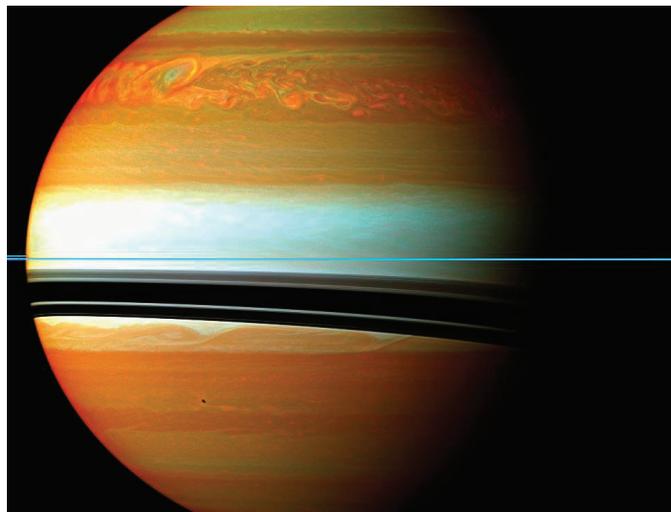
As for atmospheric events that are visible to Earth-bound

telescopes, Edgington is particularly grateful for non-professional astronomers. While these astronomers are free to watch a planet continuously over long periods and record their finding in photographs, Cassini and its several science instruments must be shared with other scientists. Observation time on Cassini is planned more than six months in advance, making it difficult to immediately train it on the unexpected. That's where the volunteer astronomers come in, keeping a continuous watch on the changes taking place on Saturn.

Edgington says, "Astronomy is one of those fields of study where amateurs can contribute as much as professionals."

Go to <http://saturn.jpl.nasa.gov/> to read about the latest Cassini discoveries. For kids, The space Place has lots of ways to explore Saturn at <http://spaceplace.nasa.gov/search/cassini/>.

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



Caption: This false-colored Cassini image of Saturn was taken in near-infrared light on January 12, 2011. Red and orange show clouds deep in the atmosphere. Yellow and green are intermediate clouds. White and blue are high clouds and haze. The rings appear as a thin, blue horizontal line.

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.