

PRIMEFOCUS

Tri-Valley Stargazers



November 2014



Meeting Info

What:

Astronomy Volunteers Needed for National Park Service

Who:

Bill and Susan O'Neil

When:

November 21, 2014
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
Eclipses: Near and Far	5
What's Up	6
NASA's Space Place	7
Membership/Renewal Application	8

November Meeting

Astronomy Volunteers Needed for National Park Service Bill and Susan O'Neil

Our November speakers will be Bill O'Neil, and his wife, Susan. They worked as Astronomy Park Rangers (volunteers) up at Glacier National Park in Montana in August 2013. The National Park Service has suffered budget cuts, sequestration, furloughs, etc., and the parks are always looking for volunteer summer help.

Started in 2007, the Astro-VIP (Volunteer-in-Parks) program is seeking qualified amateur astronomers to help park visitors appreciate the dark skies and starry night experience that National Parks can provide, far away from city lights.

Bill will talk about the Astro-VIP program, qualifications, the 'hiring' process, work schedules, and their time at Glacier National Park. Bill & Susan ran a Solar Program during the day, and a night time Star Party in the evening, using Glacier Park's excellent astronomy equipment. They logged over 4,500



Caption: Bill and Susan at Glacier National Park with the telescopes they used for the solar observing program they sponsored.

park visitors that looked through the telescopes just in the month of August. To see a short YouTube video of their ASTRO-VIP adventure and Glacier's Going-to-the-Sun Road, go to http://youtube/v61_yVCsgQI

Bill is a recently retired Silicon Valley semiconductor engineer (MSEE) who has gotten back into astronomy. Bill is a Director of SJAA and they are active members of SCAC and FPOA. Bill recently worked with TVS and EAS solar astronomers at the Boy & Girl Scout STEM Encampment at Alameda County Fairgrounds in Pleasanton on Oct. 11, 2014.

News & Notes

2014 and 2015 TVS Meeting Dates

The following lists the TVS meeting dates for 2014 and 2015. 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
Nov. 21	Nov. 24	
Dec. 19	Dec. 22	Nov. 28
Jan. 16	Jan. 19	Dec. 30
Feb. 20	Feb. 23	Jan. 30
Mar. 20	Mar. 23	Feb. 27
Apr. 17	Apr. 20	Mar. 27
May 15	May 18	Apr. 24
Jun. 19	Jun. 22	May 29
Jul. 17	Jul. 20	Jun. 26
Aug. 21	Aug. 24	Jul. 31
Sep. 18	Sep. 21	Aug. 28
Oct. 16	Oct. 19	Sep. 25
Nov. 20	Nov. 23	Oct. 30
Dec. 18	Dec. 21	Nov. 27

Money Matters

Treasurer Roland Albers indicates that as of October 20, 2014 the TVS checking account balance is: \$12,528.31.

2015 RASC Observer's Handbooks and Calendars

Pre-ordered RASC Observer's Handbooks and Calendars will be available for distribution at the November meeting. Those who can't make the meeting should email Roland (see the Officer's Block on p. 3) to make arrangements for picking them up.

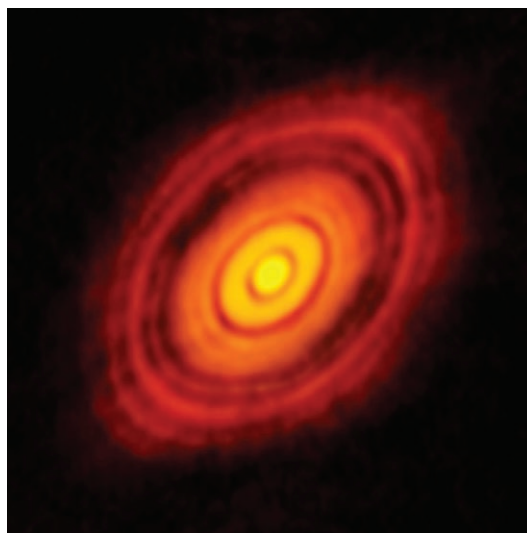
TVS Election for Club Officers

At this month's meeting we will be holding club elections. The candidates are Chuck for president, Rich Combs for vice-president, Jill for secretary, and Roland for Treasurer. Of course, any additional nominations are welcome.

Journal Club By Ken Sperber

HL Tauri Protoplanetary Disk Imaged by ALMA

ALMA, the Atacama Large Millimeter/submillimeter Array in Chile, has imaged the protoplanetary disk that surrounds HL Tauri. HL Tauri is a nascent star that is less than 1 million years old, and it has yet to evolve onto the main sequence. It is spectral type K9, an orange dwarf star that is ~0.6-0.9 times the mass of the Sun with a surface temperature of 3900-5200K. HL Tauri is located in the Taurus molecular Cloud, which is about 450 light years distant from Earth.



Caption: This new image from ALMA, the Atacama Large Millimeter/submillimeter Array, reveals extraordinarily fine detail that has never been seen before in the planet-forming disc around a young star. These are the first observations that have used ALMA in its near-final configuration and the sharpest pictures ever made at submillimeter wavelengths. The new results are an enormous step forward in the observation of how protoplanetary discs develop and how planets form. Credit: ALMA (ESO/NAOJ/NRAO)

The dark areas in the image are gaps that have been swept out as the process of planet formation proceeds. Given the age of HL Tauri, the image indicates that planet formation appears to proceed more quickly than current theories predict. The processes by which the gas and dust in the protoplanetary disk coagulate and grow in size to eventually form planets are poorly understood. Thus, this new result will challenge theorists to improve their models of solar system formation.

The diameter of the HL Tauri protoplanetary disk is approximately 180 Astronomical Units, corresponding to 3x the diameter of Neptune's orbit. The ability of ALMA to resolve the gaps in the protoplanetary disk is through the use of long baseline interferometry with the fifty 12-meter radio dishes spread over a 15km baseline. Millimeter and submillimeter wavelengths are needed to view the protoplanetary disk since the dust obscures visible light.

For more information see: www.eso.org/public/news/eso1436/ and www.universetoday.com/116000/alma-shows-off-baby-pictures-baby-planets-that-is/ Also see: www.universetoday.com/116060/its-complicated-hubble-survey-finds-unexpected-diversity-in-dusty-discs-around-nearby-stars/ to see the variety of debris disks the Hubble Space telescope has observed.

Header Image: 4 of the radio dishes that compose the Atacama Large Millimeter/submillimeter Array (ALMA). Credit: Iztok Bončina/ALMA (ESO/NAOJ/NRAO)

Calendar of Events

November 14, 6:00pm

What: Civilian Space Exploration: Personalizing Your Access to Space!
Who: Thomas Atchison, Founder of Mavericks Civilian Space Foundation
Where: Chabot Space and Science Center, 10000 Skyline Blvd., Oakland, CA 94619
Cost: \$12; does not include admission to the Center
Reservations: (510) 336-7373

Thomas Atchison is helping ignite the next space race among the general public. Through the creation of space exploration STEM education and professional development programs and research projects, Mavericks is helping students of all ages discover a passion for space exploration and create the new technologies that will lower costs and increase availability for the next generation. Learn about the history of space exploration, Mavericks' current programs, research projects and flight missions and be inspired to build and launch your own rocket or space mission in your community, with your friends and family.

See <http://www.chabotspace.org/events.htm> for more information, or call (510) 336-7373.

November 18, Noon-1:00pm

What: Rise of the Machines: Mining the Kepler Data for Astrobiology
Who: Lucianne Walkowicz, Princeton University
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

Since its launch in 2009, NASA's Kepler Mission has transformed our knowledge of exoplanetary system demographics. Kepler's primary mission goal-- to quantify the occurrence rate of habitable zone Earth-size planets around Sun-like stars--has a clear connection to astrobiology. However, in ad-

dition to its planet-finding capabilities, the Kepler data may also be used to study other questions of astrobiological interest. In this talk, I will discuss my work on two such ongoing projects: the quantification of the stellar flare rate, which influences planetary habitability through its influence on atmospheric photochemistry and escape; and the detection of anomalous stellar variability as a form of signal-agnostic optical SETI. Both of these lines of research employ machine learning techniques, making them applicable to the current and future large datasets that now dominate the astronomical landscape.

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

November 25, 12:00pm

What: A link between meteoritic organic compounds and the homochirality of life?
Who: George Cooper, NASA Ames
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

Current theories suggest that portions of interstellar compounds should eventually be incorporated into the comets, "asteroids" and planets of new planetary systems. Astronomical observations point to processes such as the formation of comet and asteroid belts, familiar to our solar system, as likely occurring in many star systems. As with comets and asteroids, the formation of organic compounds around new-formed stars might be a common process. The only laboratory items available for the study of a wide range of primordial organic-chemical processes are carbonaceous meteorites.

Among the most interesting features (and relevant to origin of life studies) of carbonaceous meteorites are the enantiomer excesses possessed by some of their organic compounds. A question of relevance is: did extraterrestrial sources aid in

continued on page 4

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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 (info@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)

the beginning of life's homochirality? This presentation will include the results of recent analyses of enantiomer ratios of meteoritic compounds as well attempts at laboratory re-creation of such excesses.

If the forces that acted on organic compounds (and/or their precursors) in the early Solar System are common, then specific laboratory experiments may indicate whether enantiomer excesses in organic compounds are available for the origin of life in a multitude of planetary systems.

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

December 9, Noon-1:00pm

What: Rosetta at Comet Churyumov-Gerasimenko: Humanity's First Attempt to Land on a Comet
Who: Claudia J. Alexander, Jet Propulsion Laboratory
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

No abstract available.

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

December 8, 7:30pm

What: Exploring Alien Worlds
Who: Nick Cowan, Assistant Professor of Astronomy, Amherst College
Where: California Academy of Science, 55 Music Course Dr., Golden Gate Park, San Francisco, CA
Cost: Advanced ticketing required. Academy members \$8, Seniors \$10, General \$12. Reserve a space online or call 1-877-227-1831.

Thousands of planets orbiting other stars have been discovered since the 1990's. The existence of extrasolar planets confirms that planets are commonplace, but closer inspection of these planetary systems reveals that they are completely different from our Solar System. Cowan will discuss how we can observe the atmospheres of exoplanets with current and future telescopes, despite the fact that our targets are pale dots next to bright stars. Current observations of exoplanets are sufficient to infer clouds, winds, and greenhouse gases on these alien worlds. Evaluating the large-scale planetary climate for dozens (and soon hundreds) of worlds will eventually revolutionize our understanding of all planets, including Earth. Over the course of the presentation, we will explore what makes Earth habitable and will estimate the likelihood that similar climates exist on nearby exoplanets.

See www.calacademy.org/events/benjamin-dean-astronomy-lectures for lecture and reservation information.

December 18, Noon-1:00pm

What: Exploring the Inner Edge of the Habitable Zone in the Early Solar System
Who: Michael Way, Goddard Institute for Space Studies
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

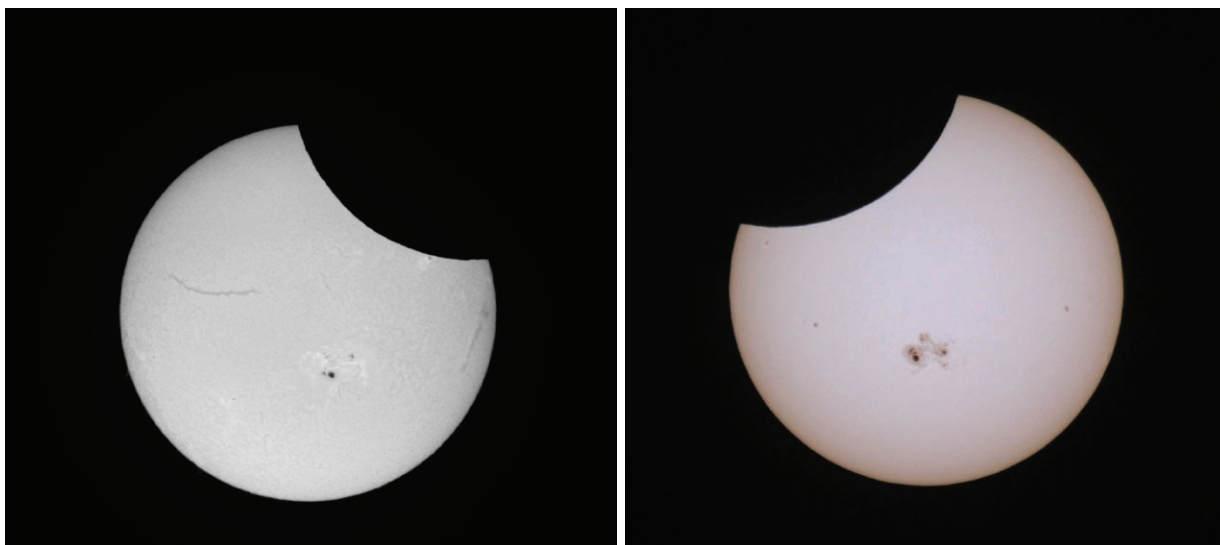
3-D models can help explore the possible roles of rotation, atmosphere and ocean dynamical transports, cloud feedbacks and sea ice-albedo feedbacks in determining the habitability of a range of planetary environments. Using recent modifications to the Goddard Institute for Space Studies (GISS) IPCC AR5 General Circulation Model (GCM) we have explored the Inner Edge of the habitable zone (HZ) of our Solar System. We find that while Venus is currently outside the HZ, it may have been close to or within it early in Solar System history when the solar luminosity was lower and an ocean may have been present. The GISS GCM maintains habitable equilibrium surface temperatures for a solar constant 40% stronger than present day Earth (comparable to the Faint Young Sun at Venus' orbit) even if Venus rotated as rapidly as Earth early in its history. Stratospheric water vapor concentration is an order of magnitude smaller than the classical water loss limit for this simulation. We have also explored the parameter space in models with slower rotation rates. Our results are based on an atmosphere coupled to a 100m mixed layer ocean with no ocean heat transport. We are currently running the same experiments with a fully coupled dynamic ocean. Negative cloud feedbacks due to increasing high, thick clouds in the tropics as the planet warms appear to be the stabilizing mechanism, along with maintenance of subsaturated water vapor by the general circulation.

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

Eclipses: Near and Far



Caption: Roland Albers made this composite of two photos he took at mid-eclipse (~3:55 AM) on October 8, 2014. The Moon image is a 2.5s exposure taken with a Canon DSLR with a 200mm lens at f/8 and 100 ISO. The star field comes from a 60s exposure with the same camera and settings. He used Photoshop to combine the two photos, sharpen the stars, and darken the sky background. Roland says: "Although no photo can come close to the beauty of the real thing, this image approximates the view of the eclipse through binoculars as closely as possible." The "star" about one lunar diameter away from the Moon at about 7-o'clock is actually the planet Uranus shining at magnitude 6.05. The other bright star a little farther away and at about 4-o'clock is 96 G. Piscium, a 5.7 magnitude K2 star.



Caption: Gert Gottschalk took these images of the October 23, 2014 solar eclipse from Fremont. The image on the left was taken with a Lunt LS100PT solar H-Alpha telescope and Canon XSi (450D) at 2:19:32 PM. The image on the right was taken with a Baader white-light solar filter using a Canon telephoto lens at 560mm FL at 4:07:27 P.M. See his website for more solar eclipse images that depict the full event: http://www.trivalleystargazers.org/gert/sofi_141023/sofi.htm

continued on page 6

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

All times are Pacific Standard Time.

November

- 14 Fri Last-Quarter Moon (10:16am)
- 17-18 Mon- Leonid Meteor Shower visible on the mornings of the 17th and 18th (see p.50 November S&T)
- 22 Sat New Moon (4:32am)
- 22 Sat Algol at minimum brightness for 2 hours centered on 8:50pm PST
- 25 Tue Mars to the left of the crescent Moon (Dusk)
- 29 Sat First-Quarter Moon (2:06am)

December

- 5 Fri Aldebaran and the Hyades near the almost full Moon
- 6 Sat Full Moon (4:27am)
- 11-12 Thu- Jupiter above the waning gibbous Moon
- 13-14 Sat Geminid Meteor shower (all night, best before midnight Moon rise)
- 14 Sun Last-Quarter Moon (3:51am)
- 15 Mon Algol at minimum brightness for 2 hours centered on 7:22pm
- 21 Sun Winter begins at 3:03pm
- 21 Sun New Moon (5:36pm)
- 22 Mon Thin crescent Moon to the right of Venus in the low west-southwest (Binoculars needed, Dusk)
- 28 Sun First-Quarter Moon with Uranus nearby(10:31am)



Caption: Andy Coutant took this image of Europa, Io, and Jupiter (left-to-right) on October 29, 2014 at 5:32am from Dublin. Io's shadow is seen transiting Jupiter to the north of the Great Red Spot. Andy set up his scope in his backyard before going to bed and he woke up at 3:30 am to begin shooting. He captured many good shots showing the full transit of the Red Spot and Io's shadow, as well as Io itself. He used a Celestron CPC Edge HD 11" and a Celestron Neximage Solar System Burst Camera with which he captured 950 frames in a 35-second video, then keeping only the best 30% of the frames (285) for the final stack to create this picture. We are entering a period of alignment with the orbital plane of Jupiter's moons during which the moons will occult one another. See <http://www.universetoday.com/115814/observing-challenge-catch-a-series-of-mutual-eclipses-by-jupiters-moons/>



Where does the sun's energy come from?

National Aeronautics and Space Administration



Every 1.5 millionths of a second, the sun releases more energy than all humans consume in an entire year. Its heat influences the environments of all the planets, dwarf planets, moons, asteroids, and comets in our solar system.

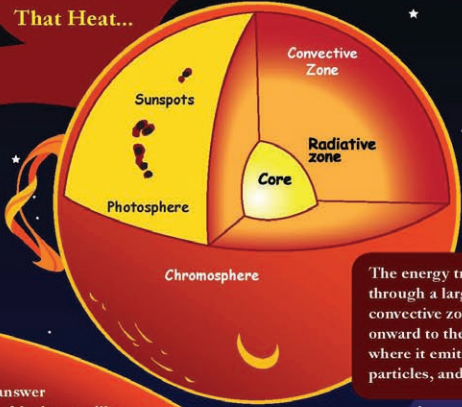
And that light travels far out into the cosmos—just one star among billions and billions.

Create a 'solar wind' that pushes against the fabric of interstellar space billions of miles away.

Allows gases and liquids to exist on many planets and moons, and causes icy comets to form fiery halos.

Powers the chemical reactions that make life possible on Earth.

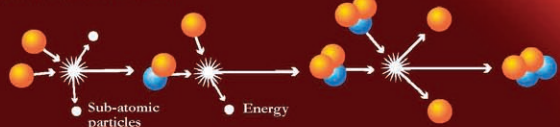
That Heat...



The energy travels outward through a large area called the convective zone. Then it travels onward to the photosphere, where it emits heat, charged particles, and light.

How does a big ball of hydrogen create all that heat? The short answer is that it is big. If it were smaller, it would be just a sphere of hydrogen, like Jupiter. But the sun is much bigger than Jupiter. It would take 433,333 Jupiters to fill it up!

That's a lot of hydrogen. That means it's held together by a whole lot of gravity. And THAT means there is a whole lot of pressure inside of it. There is so much pressure that the hydrogen atoms collide with enough force that they literally meld into a new element—helium.



Nuclear Fusion

This process—called nuclear fusion—releases energy while creating a chain reaction that allows it to occur over and over and over again. That energy builds up. It gets as hot as 15 million degrees Fahrenheit in the sun's core.





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

Tri-Valley Stargazers Membership Application

(or apply for membership online: www.trivalleystargazers.org/membership.shtml)

Contact information:

Name: _____ Phone: _____

Street Address: _____

City, State, Zip: _____

Email Address: _____

Status (select one): _____ New member _____ Renewing or returning member

Membership category (select one): Membership term is for one calendar year, January through December.

_____ Student member (\$5). Must be a full-time high-school or college student.

_____ Regular member (\$30).

_____ Patron member (\$70). Patron membership grants use of the club's 17.5" reflector at H2O. You must be a member in good standing for at least one year, hold a key to H2O, and receive board approval.

Hidden Hill Observatory Access (optional):

_____ One-time key deposit (\$20). This is a refundable deposit for a key to H2O. New key holders must first hear an orientation lecture and sign a usage agreement form before using the observing site.

_____ Annual access fee (\$10). You must also be a key holder to access the site.

Magazine Subscriptions (optional): Discounted subscriptions are available only to new subscribers. All subsequent renewals are handled directly with the magazine publishers.

_____ One-year subscription to Sky & Telescope magazine (\$32.95).

_____ One-year subscription to Astronomy magazine (\$34).

Donation (optional):

_____ Tax-deductible contribution to Tri-Valley Stargazers

Total enclosed: \$ _____

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. TVS will not share information with anyone other than other club members and the Astronomical League without your express permission.

Mail this completed form along with a check to: Tri-Valley Stargazers, P.O. Box 2476, Livermore, CA 94551.