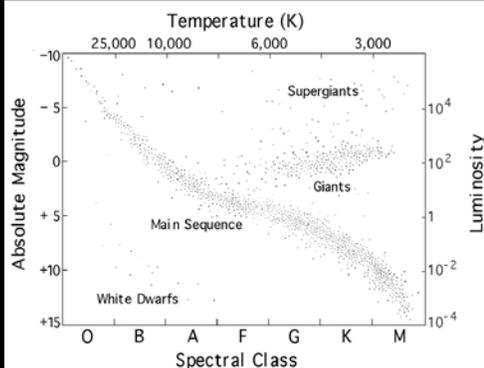


PRIMEFOCUS

Tri-Valley Stargazers



November 2010



Meeting Info:
What: The Lives of Stars

Who: Dr. Ken Croswell

When:
November 19, 2010
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	3
Calendar of Events	4
What's Up	6
NASA's Space Place	7
Membership/Renewal Application	8

November Meeting

The Lives of Stars

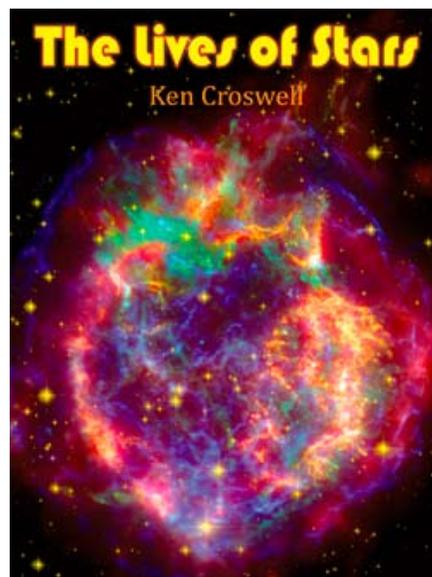
Dr. Ken Croswell

The stars that speckle the sky have long fascinated humanity, but only in the past century have astronomers figured out how stars are born, live, and die. Now we can use this knowledge to address the question: Which stars near the Sun might have planets with intelligent life? Drawing on both the laws of stellar evolution and the latest discoveries of extrasolar planets, Harvard-trained astronomer Dr. Ken Croswell describes the lives of stars and the alien worlds they may support.

Ken Croswell is an astronomer and author in Berkeley, California. He first became interested in astronomy during first grade. In high school, he earned first place in the Priscilla and Bart Bok Awards. He graduated summa cum laude from Washington University, where he majored in physics and minored in English literature and mathematics. He earned his Ph.D. in astronomy from Harvard University for studying the Milky Way. During his research, he discovered a halo star located 90,000 light-years above the plane of the Galaxy.

Dr. Croswell is the author of eight books on astronomy: *The Alchemy of the Heavens*, finalist for a Los Angeles Times Book Prize; *Planet Quest*, a New York Times Notable Book of the Year; *Magnificent Universe*, a number one Amazon best seller in Massachusetts; *See the Stars*, the easiest constellation guide ever published; *The Universe at Midnight*, a New Scientist Must-Read Best Book of the Year; *Magnificent Mars*, the largest full-color Mars book ever published; *Ten Worlds*, recipient of a Publishers Weekly starred review; and *The Lives of Stars*. He has also written for National Geographic, New Scientist, The New York Times, The Wall Street Journal, and other publications as well as for the StarDate radio show. For many years he has been the astronomy consultant for Highlights for Children. He does not write for magazines that carry tobacco advertisements--and remember, Altria means tobacco.

For more information about Ken, see: <http://kencroswell.com/>



News & Notes

2010-2011 TVS Meeting Dates

The following lists the TVS meeting dates for 2010-2011. 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
Nov. 19	Nov. 22	
Dec. 17	Dec. 20	Nov. 26
Jan. 21	Jan. 24	Dec. 31
Feb. 18	Feb. 21	Feb. 01
Mar. 18	Mar. 21	Feb. 28
Apr. 15	Apr. 18	Oct. 29
May 20	May 23	Nov. 26
Jun. 17	Jun. 20	Oct. 29

Money Matters

Treasurer David Feindel indicates that as of the October 18, 2010 the TVS account balances are:

Checking	\$4,638.17	
CD #1	\$3,762.36	rolled over 8/17/2010
CD #2	\$2,655.68	rolled over 8/27/2010

TVS Elections/Volunteers Needed

There is yet one more election to take place this month, that which will determine the TVS club officers for the next year. Although all the current officers and board members are willing to continue in their capacities, they wouldn't mind handing over the reins to someone else. We'll have our election at the beginning of the meeting before the talk. Nominations will be accepted at the time of the vote.

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.

San Jose Astronomical Association's Fall Swap Meet

The San Jose Astronomical Association's fall swap meet is Sunday, November 21, 2010 from 12 noon to 4pm. If anyone is thinking of going, we still have a few items from the Jim Noccar donation that could be sold. If you are willing to take on this task on behalf of the club, please contact a club officer at this month's meeting.

School Star Party: Volunteers Needed

The Murray Elementary School in Dublin school has requested a star party for Tuesday, November 16th, with the 30th as the bad weather back up date. At last count 134 students/parents are planning to attend, so we need as many volunteers to show up a possible to ensure a successful event. The

set up time is 6pm, with stargazing from 6:30 to 8pm. If you can assist please reply via the TVA Yahoo users group, or contact a club officer at the meeting.

H2O Observatory Maintenance is Successful!!!

We all owe a debt of gratitude to Chuck Grant, Jim Alves, Jim Gansemer, Gert Gottschalk, and Wayne Miller for devoting their time and effort in performing much needed maintenance on the club observatory at H2O. After being thwarted by uncooperative weather on past weekends, the crew replaced weather-worn panels, added weather flashing at critical locations, and repainted the whole structure! The transition from "toad to prince" was chronicled by Gert in the series of photos below. Thanks, guys!



Header Image: This is a Hertzsprung-Russell diagram that characterizes stars by their luminosity and temperature. Stars spend most of their lives on the main sequence, moving off after the cessation of hydrogen fusion. For more information see: http://imagine.gsfc.nasa.gov/docs/science/knownow_12/stars.html. Image Credit: NASA Goddard Space Flight Center.

The Future of Io's Volcanism (two tales of woe)

What do Io and the Moon have in common? At first glance you might think they have nothing in common, as Io is the most volcanically active body in the Solar System, and the Moon is geologically dead (though the occasional moonquake does rattle the ground). As it turns out, both moons are exchanging angular momentum with their host planet, but the net effect is different in the Jupiter-Io system because Europa and Ganymede also affect Io's orbit.



This image of Io was taken on Nov. 17, 1997 during the 9th orbit of the Galileo spacecraft around Jupiter. The plume on the limb extends about 86 miles above the surface of Io. Image Credit: NASA/JPL/University of Arizona

In the Earth-Moon system the tide that the Moon raises on the Earth is the dominant interaction. Since the Earth rotates faster than the Moon orbits, the tidal bulge on Earth lies ahead of the Earth-Moon alignment. Thus, the Moon pulls on the tidal bulge slowing down the Earth's rotation. As a result our days are getting longer. The bulge pulls the Moon forward in its orbit and it moves further away from the Earth. As the Moon recedes from the Earth its angular size in the sky becomes smaller, such that (millions of years) in the future there will no longer be any total solar eclipses...

In the Jupiter-Io system, the tide that Io raises on Jupiter acts in the same manner, slowing Jupiter down and causing Io to gain orbital energy and recede from Jupiter. BUT, Jupiter also raises a substantial tide on Io, causing its crust to rise and fall by 10 meters! This tidal effect is most pronounced when Io is closest to Jupiter when Io is orbiting faster than it is rotating. Thus, Io's tidal bulge lies behind the Jupiter-Io alignment, and Jupiter's pull on the bulge causes Io to rotate faster and move closer to Jupiter. Since Io's orbit is eccentric the location of the Io's tidal bulge changes during its orbit of Jupiter, and the resulting friction within Io heats the crust causing Io's volcanic activity. The eccentricity of Io's orbit is maintained due to the Laplace orbital resonance between Io, Europa, and Ganymede. For every four Io orbits, Europa orbits Jupiter twice, and Ganymede orbits Jupiter once. Thus, Europa and Ganymede repeatedly tug on Io at the same locations in their respective orbits, and give Io an eccentric orbit. Lainey et al. (2009) are the first researchers to directly include the tidal effects of Jupiter and Galilean moons in a numerical model. They have determined that the tide that Jupiter raises on Io dominates, and Io is speeding up in its orbit and moving closer to Jupiter. Meanwhile, Europa and Ganymede are moving further away from Jupiter. The consequence of

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
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.

Journal Club (continued)

the orbital changes is that Io, Europa, and Ganymede will eventually move out of their Laplace orbital resonance. Once this occurs the orbit of Io will circularize about Jupiter and the tidal bulge that Jupiter raises on Io will occur at the same location. As such the bulge will no longer migrate around Io and tidal friction will no longer occur and volcanism on Io will cease...

For more information, see: Lainey et al. (2009) *Nature*, 459, 957-959, Schubert (2009) *Nature*, 459, pp.920, and *Physics Today*, August 2009, pp. 11-12.

Calendar of Events

November 17, 12:00 - 1:00 pm

What: Status of the James Webb Telescope and its Capabilities for Exoplanet Science
Who: Mark Clampin, Goddard Space Flight Center
Where: New SETI Headquarters, 189 N. Bernardo Ave., Mountainview
Cost: Free

The James Webb Space Telescope (JWST) is a large aperture (6.5 meter), cryogenic space telescope with a suite of near and mid-infrared instruments covering the wavelength range of 0.6 μm to 28 μm . JWST's primary science goal is to detect and characterize the first galaxies. It will also study the assembly of galaxies, stellar and planetary system formation, and the formation and evolution of planetary systems. Dr. Clampin will review the design of JWST, and discuss the current status of the project, with emphasis on recent technical progress in the construction of the observatory. He also review the capabilities of the observatory for observations of exosolar planets by means of transit photometry and spectroscopy, direct coronagraphic imaging, and high contrast imaging and spectroscopy. He will discuss the current predictions for the performance of the observatory, with special reference to the demands of exoplanet science observations.

This lunchtime talk is part of the SETI Institute Colloquium Series. For more info, visit their web site <http://www.seti.org/csc/lectures>, e-mail info@seti.org, or phone 650-961-6633.

November 17, 7:00 - 8:30 pm

What: Catching Shadows: Kepler's Search for New Worlds
Who: Dr. Natalie Batalha, San Jose State University and the Kepler Mission
Where: Foothill College, Smithwick Theatre, 12345 El Monte Road, Los Altos Hills, CA 94022
Cost: Admission: Free; Parking: \$2

Humanity's quest to learn about the existence of other worlds like our own has made a huge step forward with the launch of NASA's Kepler spacecraft in March 2009. The mission is de-

signed to survey a slice of the Milky Way Galaxy to identify planets orbiting other stars. Kepler has the advantage that it can find planets as small as Earth in or near the habitable zone of each star. It will help us determine if such planets are abundant in our galaxy. Dr. Batalha will describe the techniques used by the Kepler team to identify Earth-size planets and share some of the mission discoveries to date.

Natalie Batalha is a professor of physics and astronomy at San Jose State University in the heart of Silicon Valley, and the Deputy Science Team Lead for NASA's Kepler Mission. She holds a bachelor's in physics from the University of California, Berkeley, and a doctorate in astrophysics from UC Santa Cruz. After a post-doctoral fellowship in Rio de Janeiro, Brazil, Batalha became inspired by the growing number of planets being discovered around other stars (500 such planets are currently known.) Eleven years later, she stands poised with the Kepler team to learn whether or not Earth-sized planets are abundant in our galaxy.

Purchase a parking permit for \$2 from dispensers in any student lot. Parking lots 1, 7 and 8 provide stair and no-stair access to the theatre. Parking regulations are enforced and citations are issued. For more information see <http://www.foothill.edu/news/newsfmt.php?words=astronomy> or <http://www.foothill.edu/ast/news.htm#Anchor1> or call (650) 949-7888.

December 1, 12:00 - 1:00 pm

What: IRIS: a new window on the physics of the solar interface region
Who: Bart De Pontieu, Lockheed Martin Company
Where: New SETI Headquarters, 189 N. Bernardo Ave., Mountainview
Cost: Free

The Sun's outer atmosphere or corona is heated to millions of degrees, considerably hotter than its cool surface or photosphere. Explanations for this long-standing enigma typically invoke the deposition in the corona of non-thermal energy generated by the interplay of convection and magnetic fields. However, the exact physical mechanism driving coronal heating remains unknown. During the past few years, recently built instruments like the Japanese Hinode satellite, the Swedish Solar Telescope in Spain and NASA's Solar Dynamics Observatory (SDO) combined with advanced numerical simulations have revealed a new window into how the Sun's atmosphere is energized. These results directly challenge current theories and highlight the importance of the interface region between the photosphere and corona for understanding how the solar atmosphere is heated. Dr. De Pontieu will present some of these results and describe how NASA's recently selected Interface Region Imaging Spectrograph, which is being built by Lockheed Martin's Solar and Astrophysics Laboratory in Palo Alto, in collaboration with NASA Ames, Smithsonian Astrophysical Observatory (SAO),

Calendar of Events (continued)

and Montana State University.

This lunchtime talk is part of the SETI Institute Colloquium Series. For more info, visit their web site <http://www.seti.org/csc/lectures>, e-mail info@seti.org, or phone 650-961-6633.

December 6, 7:30 pm

What: The Dark Universe and the Origin of Structure
Who: Josh Frieman, Kavli Institute for Cosmological Physics, University of Chicago
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

Josh Frieman is a senior staff scientist at the Fermilab Center for Particle Astrophysics and Professor of Astronomy and Astrophysics and a member of the Kavli Institute for Cosmological Physics at the University of Chicago. He currently directs the Dark Energy Survey, a collaboration of more than 120 scientists worldwide which is building a 570-Megapixel camera for a telescope in Chile to probe the origin of cosmic acceleration.

For more information please see: <http://www.calacademy.org/events/lectures/>

December 8, 12:00 - 1:00 pm

What: Microbial Dark Matter in Glacial Ice and implications for Martian life
Who: P. Buford Price, Professor, Graduate School, UC Berkeley
Where: New SETI Headquarters, 189 N. Bernardo Ave., Mountainview
Cost: Free

Life may have arisen independently on both Mars and Earth, may survive in subsurface niches on Mars, and may manifest itself via emission of gases such as methane. Microbes adapted to life in ice at low temperatures metabolize at a rate many orders of magnitude lower than their rate for exponential growth. Life in solid ice survives either until nutrients and bioelements are consumed or until alpha-particles from U and Th in the ice induce too many double-strand breaks. Our studies with scanning fluorimetry of ice cores and flow cytometry of microbes in melted ice have shown that *Prochlorococcus*, the dominant phototroph in the ocean, is also the dominant phototroph in Antarctic ice. Dr. Price will talk about the story of how this bacterium came to be discovered in ice and how changes in its tiny genome as a function of its depth may enable its evolution to be followed over up to a million generations.

This lunchtime talk is part of the SETI Institute Colloquium Series. 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 by Ken Sperber (adapted from Sky and Telescope)

All times Pacific Standard, unless otherwise noted.

November

- 15 Mon Algol, an eclipsing binary, is at minimum brightness, magnitude 3.4 for ~2 hours centered at 9:41pm
- 17-18 Wed Leonid Meteor Shower best viewed after moonset (3-4am through predawn)
- 21 Sun Full Moon (9:27am)
- 28 Sun Last-Quarter Moon (12:36pm)

December

- 2 Thur Algol, an eclipsing binary, is at minimum brightness, magnitude 3.4 for ~2 hours centered at 11:35pm
- 5 Sun New Moon (9:36am)
- 13 Mon First-Quarter Moon (5:59am)
- 13-14 Mon- Geminid Meteor Shower peaks
- 18 Sat Conjunction between the Pleiades and the Moon
- 20-21 Mon Total Eclipse of the Moon visible from the US! Totality from 11:41pm to 12:53am, with the partial phases lasting 1+hours before and after totality; Full Moon (12:13am, about mid-eclipse)
- 21 Tue Winter Solstice (3:38pm); longest night of the year



This is an image of M33 taken by Ken Sperber at H2O on the night of October 9-10 using a 4" Takahashi @ f/8. The total exposure time for this luminance image is 1hr 45 minutes using 5-minute sub-exposures. I'm still having an undiagnosed problem with the system losing focus during the course of the night, though years of past experience have not shown a temperature effect on focus. The luminance images were taken in sequence with red, green, and blue images, with the sequence repeated every 45 minutes. Every 1.5 hours I had to refocus as the star images increasingly bloated, and therefore the counts of the guide star also diminished, which for the blue frames meant that the camera would occasionally lose the guidestar. Working out the focus issue may have to wait until the spring. Soon I'll process the RGB frames an attempt to make a nice color image.



Close Encounters with Jupiter

by Dr. Tony Phillips

Jupiter and Earth just had a close encounter—and it was a good one. In late September 2010, the two worlds were 31 million km (about 19 million miles) closer than at any time in the past 11 years. Soaring high in the midnight sky, Jupiter shone six times brighter than Sirius and looked absolutely dynamite through a backyard telescope.

Planetary scientist Scott Bolton of the Southwest Research Institute isn't satisfied. "I'd like to get even closer," he says.

Bolton will get his wish in July 2016. That's when a NASA spacecraft named "Juno" arrives at Jupiter for a truly close-up look at the giant planet. Swooping as low as 5,000 km (about 3,000 miles) above the cloud tops, Juno will spend a full year orbiting nearer to Jupiter than any previous spacecraft.

The goal of the mission is to learn what lies inside the planet.

Astronomers have been studying Jupiter since the invention of the telescope 400 years ago, but in all that time the planet's vast interior has remained hidden from view. Even the Galileo probe, which dived into the clouds in 1995, penetrated no more than about 0.1% of Jupiter's radius.

"Our knowledge of Jupiter is truly skin deep," says Bolton, Juno's principal investigator. "There are many basic things we just don't know—like how far down does the Great Red Spot go? And does Jupiter have a heavy core?"

Juno will improve the situation without actually diving into the clouds. Bolton explains how. "Juno will spend a full year in close polar orbit around Jupiter, flying over all latitudes and longitudes. We will thus be able to fully map Jupiter's gravitational field and figure out how the interior is structured."

But that's not all. Researchers have good reason to believe that much of Jupiter's interior is filled with liquid metallic hydrogen, an exotic metal that could form only in the high-pressure, hydrogen-rich core of a giant planet. Jupiter's powerful magnetic field almost certainly springs from dynamo action inside this vast realm of electrically conducting metal.

"Juno's magnetometers will precisely map Jupiter's magnetic field," says Bolton. "This map will tell us a great deal about planet's inner magnetic dynamo—what it's made of and how it works."

Finally, Juno will probe Jupiter's atmosphere using a set of microwave radiometers. "Our sensors can measure the temperature 50 times deeper than ever before," says Bolton. Researchers will use that information to figure out how much water is underneath Jupiter's clouds. "Microwave measurements of Jupiter's water content are particularly exciting because they will help discriminate among competing theories of the planet's origin."

Now that's a close encounter. Stay tuned for Juno.

Find out more about the Juno mission at http://www.nasa.gov/mission_pages/juno. Play the new Solar System Explorer super game, which includes the Juno Recall mini-game at <http://spaceplace.nasa.gov/en/kids/solar-system>. It's not just for kids!

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



The Juno mission, arriving at Jupiter in July 2016, will help to solve the mystery of what's inside the giant planet's core.

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



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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.