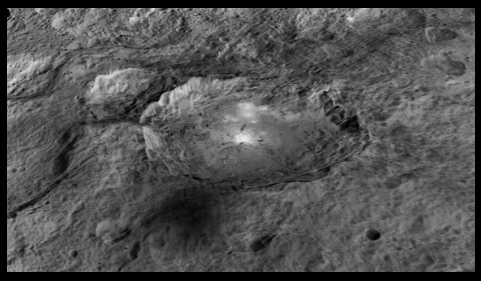
PRIMEFOCUS

Tri-Valley Stargazers



August 2015

Meeting Info

What:
Vaporizing Planets and Raining Iron

Who:
Dr. Richard Kraus

When:
August 21, 2015
Doors open at 7:00 p.m.
Meeting at 7:30 p.m.
Lecture at 8:00 p.m.

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

Inside

August Meeting

Vaporizing Planets and Raining Iron
Dr. Richard Kraus

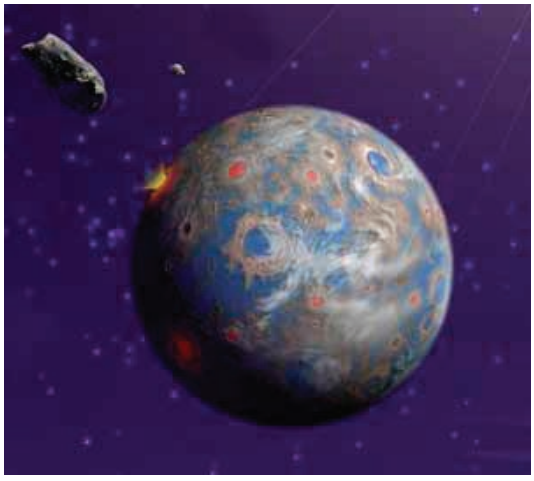


Image Caption: Impacts are a critical part of the planet formation process. Credit: NASA JPL

In this presentation I will discuss our team's recent discoveries about processes occurring during Earth's formation presented in our Nature Geoscience article "Impact vaporization of planetesimal cores in the late stages of planet formation". I will begin by presenting a bit of background on planet formation. Then I will discuss the importance of understanding high velocity impact events, as they played a tremendous role in shaping the solar system that we see today. However, our understanding of these impact events is based upon the intuition we gain from running computer simulations of these high velocity collisions (as they are far too energetic to simulate in the lab). To better understand these impact events, we need better models for how materials behave at these extreme conditions, in particular for materials like iron. At the Sandia Z machine, we developed an experimental technique to understand the process of impact induced vaporization, and we used it to determine the critical impact speed to vaporize iron cores (it's lower than one would have thought). Finally, I will discuss how this improved understanding of the physics of impacts, has important implications for understanding the timing of Earth's formation and the evolution of our solar system.

Rick Kraus received his undergraduate degree in Physics at the University of Nevada, Reno. In 2008 he received an MPhil in Physics from the University of Cambridge, UK and in 2013 he received his M.S. in Applied Physics and Ph.D. in Earth and Planetary Sciences from Harvard University. His thesis research was on the thermodynamics of planetary impact events with a focus on impact induced vaporization. In September of 2013 he joined the HED Shock Physics group at LLNL as a Lawrence Postdoctoral Fellow. He is currently a research scientist in the physics division focusing on the high pressure melting properties of materials.

News & Notes

2015 TVS Meeting Dates

The following lists the TVS meeting dates for 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**
Aug. 21	Aug. 24	
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

As of July 20, 2015 the TVS checking account balance is $11,673.28.

TVS Tesla Winery Star Parties (8pm-Midnight): September 19, & October 17

TVS will hold numerous star parties at Tesla Vintners in Livermore! Tesla Vintners is located on Tesla Road near Mines Road, and it has reasonably dark skies overhead and to the south, considering its urban location. The winery is private property, and we are the guests of Steve Powell, the owner. *These star parties are only open to current club members and their guests.*

The winery has two entrances. The main entrance is likely to be closed, so plan on using the unmarked delivery entrance, the one closer to Mines Road. The winery has a large parking area in the middle of the grounds plus a large open field in the back. We are welcome to use both, but lights from the Wente winery to the east can be a problem in the back. The winery also has a bathroom which we will be able to use. The star party will run through midnight.

Normal star party etiquette applies, so no bright lights, no dogs, no loud music, and definitely no smoking or fires.

Calendar of Events

August 15, 11:00am

What: Black Holes/Neutron Stars
Who: Dr. Francois Foucary, LBNL
Where: UC Berkeley, Genetics and Plant Biology Building, Room 100 (northwest corner of campus)
Cost: Free, limited hourly pay parking on/nearby campus. The venue is within walking distance of BART and bus lines.

In this talk, Francois will review the formation of black holes and neutron stars, how we observe these objects, and the impact of these observations on our understanding of gravity, nuclear physics, and astrophysics. He will also discuss what happens when two of these objects collide in extremely energetic events, which can produce bright but short-lived emission of light, as well as "gravitational waves" — ripples of spacetime produced by the interaction of massive objects, which have been predicted by Einstein's theory of general relativity and are expected to be detected for the first time in the next 5 years.

For more information see: http://scienceatcal.berkeley.edu/the-sciencecal-lecture-series/

August 18, 12:00pm

What: REU Students Lightning Talks
Who: Undergraduate summer students, SETI Institute
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

No details available.

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

August 22, 8:30pm

What: A Biological Perspective on the Meaning of Time
Who: Dr. Lynn Rothschild, NASA Ames
Where: Mt. Tamalpais State Park, Cushing Memorial Amphitheater, more commonly known as the Mountain Theater, Rock Spring parking area
Cost: Free

Life is a phenomenon that integrates processes ranging from the near instantaneous reactions of photosynthesis to the more stately pace of evolution. How are these processes with radically different time scales creating and maintaining the diversity of life on earth? What are the clocks that nature uses to time them? And how is modern biology being used to alter the natural time scales?

For more information see: http://www.friendsofmttam.org/astronomy/schedule

August 25, 12:00pm

What: The NASA K2 Mission: Extending Kepler's Legacy
Who: Tom Barclay, Bay Area Research Institute
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

Header Image: Occator crater, located on Ceres and imaged by the DAWN spacecraft, is 60 miles wide and 2 miles deep. Scientists are still uncertain about the make-up of the bright spots, especially since spectra are inconsistent with the presence of ice. For more information see: http://dawn.jpl.nasa.gov/news/news-detail.html?id=4677 Image credit: NASA/JPL-Caltech/UCLA/MPS/DLR/IDA/LPI

Calendar of Events (continued)

The NASA K2 mission makes use of the Kepler spacecraft to expand upon Kepler's ground-breaking discoveries in the fields of exoplanets and astrophysics through new and exciting observations. K2 uses an innovative way of operating the spacecraft by carefully balancing the pressure of photons coming from the Sun. The K2 mission offers long-term, simultaneous optical observation of thousands of objects at high precision. Ecliptic fields are observed for approximately 75-days enabling a unique exoplanet survey which fills the gaps in duration and sensitivity between the Kepler and TESS missions, and offers exoplanet target identification for JWST transit spectroscopy. Astrophysics observations with K2 include studies of young open clusters such as the Pleiades and Hyades, galaxies, supernovae, and galactic archeology.

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

September 1, 12:00pm

What: Planet Occurrence Rates with Kepler: Reaching Towards the Habitable Zone
Who: Christopher Burke, SETI Institute
Where: SETI Headquarters, 189 N. Bernardo Ave., Mountain View, CA
Cost: Free

No details available.

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

September 5, 1:00pm

What: Science Revealed Workshop
Who: Chabot Science Educator
Where: Chabot Space and Science Center, 10000 Skyline Blvd., Oakland, CA 94619
Cost: $5 Adult, $3 child, Children 2 and under free

Be dazzled with exciting demonstrations led by one of Chabot's dynamic science educators. Sudden appearances? Booms and bangs? Miraculous transformations? Enjoy a live and immersive presentation experience as you gain a deeper understanding for the way our world works. No, it's not a magic show - it's science!

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

September 5, 7:00pm

What: Lost in Space Adult Missions
Who: Challenger Learning Center
Where: Chabot Space and Science Center, 10000 Skyline Blvd., Oakland, CA 94619
Cost: $30, does not include general admission; RSVP recommended, space limited, register online or call (510) 336-7373

Just like our public missions for families, but this one is strictly for adult flyers. Bring your friends and join an intrepid team to land on the red planet, construct a probe to send to one of the moons of Mars and save your crew from calamity. Grab your flight suit, strap on a helmet and experience the thrill and excitement of a NASA simulated space mission to Mars! Beer (provided by Federation Brewery), wine and light snacks will be provided.

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

September 12 8:00pm

What: In the Land of Enchantment: A Decade Exploring Saturn
Who: Dr. Carolyn Porco, Space Science Institute, CICLOPS Director
Where: Mt. Tamalpais State Park, Cushing Memorial Amphitheater, more commonly known as the Mountain Theater, Rock Spring parking area
Cost: Free

A glistening spaceship, with seven lonely years and billions of

continued on page 4

Calendar of Events (continued)

miles behind it, glides into orbit around a softly-hued, ringed planet. A flying-saucer shaped machine descends through a hazy atmosphere and lands on the surface of an alien moon. These visions are not a dream but tell of the explorations of the Cassini spacecraft and its Huygens probe in 2004. Come along for the ride, and witness the sights and magic worked by these emissaries from Earth to the enchanting realm of Saturn.

For more information see: http://www.friendsofmttam.org/astronomy/schedule

September 14, 7:30pm

What: The NASA K2 Mission: Extending Kepler's Legacy
Who: Dr. Thomas Barclay, Director, Kepler/K2 Guest Observer Office, NASA Ames Research Center
Where: California Academy of Science, 55 Music Concourse 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.

The NASA K2 mission makes use of the Kepler spacecraft to expand upon Kepler's ground-breaking discoveries in the fields of exoplanets and astrophysics. Its observations fill the gaps between the Kepler and Transiting Exoplanet Survey Satellite missions and offer exoplanet target identification for the upcoming James Webb Space Telescope. Astrophysics observations with K2 include studies of young open clusters such as the Pleiades and Hyades, galaxies, supernovae, and galactic archeology.

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

Star Party Report By Eric Dueltgen

On July 28, 2015, nine volunteers from TVS brought their telescopes to the Girls Scouts of Northern California Camporee at the Alameda County Fairgrounds in Pleasanton. Four East Bay Astronomical Society members also brought their scopes to the event.

After Dave Lackey gave an introductory talk, we showed the girls Saturn and the Moon, as well as several deep sky objects when it got darker. The girls particularly enjoyed the views of Saturn, which is always a popular object. We were fortunate to have good weather for the event, and the bright parking lot lights where we had set up turned off promptly at 9:00 as we were promised, just as it was starting to get dark. Thank you, everyone who helped out! We had a great volunteer turnout!

TVS BBQ Report

TVS held its annual BBQ on July 17. We had a good turn out despite the BBQ occurring on the same date as the first night of the TVS Yosemite Star Party. Jill Evanko ensured a full suite of fixings was available to go with the hamburgers, veggie-burgers, and hot dogs. Ron Kane, this years grill-master, skillfully prepared the hot food, ensuring that all were well fed. The appetizers and desserts that were brought by the participants provided for a well-rounded meal. At the BBQ, the new TVS solar telescope was setup by Roland. The new scope provided nice Hydrogen-alpha views of the Sun's surface and prominences at the edge of the disk.

Caption: Club members enjoying the summer BBQ. The TVS Solar Scope is setup in the background. Image Credit: Ken Sperber

Yosemite Report By Bob McKoon

Our annual trek to Yosemite this year on July 17-18 was just two days after the new moon, and the promise of dark skies lured nine TVSers plus families to view the heavens at 7,200 feet. We had large crowds both nights and our 10 telescopes all had lines of folks eager to view Saturn, globular clusters, and the good old Ring Nebula. Pointing out the occasional passing satellite was an extra treat. As usual, our evening started around 8:30 with a 15 minute powerpoint presentation on "what's up", this year given by Dave Lackey. The presentation generated lots of questions from the public while we waited for darkness to settle in.

Friday night was glorious; dark and clear with a well defined milky way. Lots of folks got to see the Cassini division in Saturn's rings - most for the first time. Once the public drifted off, we all got down to serious viewing and astrophotography. Two of the group didn't pack up their scopes until 4 am.

On Saturday, we only had about an hour of peek-a-boo viewing between the high clouds that were rolling into the Sierras, but Saturn and a few other objects were visible for awhile, and the public got to see wonders of the night sky. We all headed back to the campground under a solid cloud cover around 11 pm.

I normally fill the twilight time after setting up my scope, by finding climbers on half dome and letting the public watch them climb and settle in for the night on a ledge. This year, I could find no climbers. What's going on? A rock slide has apparently swept away a portion of the climbing route. The park rangers didn't know about this for 9 days until climbers reported the event.

Image Caption: Bob McKoon took this picture of Half Dome from Glacier Point during the TVS Star Party Weekend at Yosemite National Park. The recent rock slide is clearly visible.

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

All times are Pacific Daylight Time.

August

11	Tue	First dawn visibility of Sirius (20 minutes before dawn)
12-13	Wed	The Perseid Meteor showers peaks on August 13 at 1am PDT
14	Fri	New Moon (7:53am)
16	Sun	Mercury 6 degrees to the right of the thin crescent Moon, very low in the west (dusk)
22	Sat	First-Quarter Moon (12:31pm)
22	Sat	Saturn less than 4 degrees away from the First-Quarter Moon (evening)
29	Sat	Venus 10 degrees above the eastern horizon (dawn)
29	Sat	Full Moon (11:35am)

September

5	Sat	Last-Quarter Moon (2:54am)
10	Thu	The waning crescent Moon shines between Venus and Mars (dawn)
11	Fri	Thin crescent Moon less than 4 degrees from Regulus (dawn)
11-25	Fri	Zodiacal light visible in the east 1-2 hours before sunrise)
12	Sat	New Moon (11:41pm)
18	Fri	The crescent Moon is less than 3 degrees form Saturn in the southwest (evening twilight)
21	Mon	First-Quarter Moon (1:59am)
22	Tue	Algol at minimum brightness for 2 hours centered on 8:20pm
24-25	Thu-	Mars is less than 1 degree from Regulus, 10 degrees to the lower-left of Venus (dawn)
27	Sun	Full Moon: Total Lunar Eclipse (7:50pm, see p.26, September S&T)

Image Caption: A brief, but dramatic outburst on Comet 67P/Churyumov-Gerasimenko occurred on July 29, 2015. These images, captured by the OSIRIS camera on the Rosetta spacecraft, were obtained at 6:06am, 6:24am, and 6:42am from a distance of about 116 miles. Scientists estimate the minimum jet speed to be 33 feet/second. The comet makes it closest approach to the Sun on Thursday, August 13. For more information see: http://blogs.esa.int/rosetta/2015/08/11/comets-firework-display-ahead-of-perihelion/ Image Credit: ESA/Rosetta/MPS for OSIRIS Team MPS/UPD/LAM/IAA/SSO/INTA/UPM/DASP/IDA

On The Brightness Of Venus

By Dr. Ethan Siegel

Throughout the past few months, Venus and Jupiter have been consistently the brightest two objects visible in the night sky (besides the moon) appearing in the west shortly after sunset. Jupiter is the largest and most massive planet in the solar system, yet Venus is the planet that comes closest to our world. On June 30th, Venus and Jupiter made their closest approach to one another as seen from Earth—a conjunction—coming within just 0.4° of one another, making this the closest conjunction of these two worlds in over 2,000 years.

And yet throughout all this time, and especially notable near its closest approach, Venus far outshines Jupiter by 2.7 astronomical magnitudes, or a factor of 12 in apparent brightness. You might initially think that Venus's proximity to Earth would explain this, as a cursory check would seem to show. On June 30th Venus was 0.5 astronomical units (AU) away from Earth, while Jupiter was six AU away. This appears to be exactly the factor of 12 that you need.

Only this doesn't explain things at all! Brightness falls off as the inverse square of the distance, meaning that if all things were equal, Venus ought to seem not 12 but 144 times brighter than Jupiter. There are three factors in play that set things back on the right path: size, albedo, and illumination. Jupiter is 11.6 times the diameter of Venus, meaning that despite the great difference in distance, the two worlds spanned almost exactly the same angular diameter in the sky on the date of the conjunction. Moreover, while Venus is covered in thick, sulfuric acid clouds, Jupiter is a reflective, cloudy world, too. All told, Venus possesses only a somewhat greater visual geometric albedo (or amount of reflected visible light) than Jupiter: 67 percent and 52 percent, respectively. Finally, while Venus and Jupiter both reflect sunlight toward Earth, Jupiter is always in the full (or almost full) phase, while Venus (on June 30th) appeared as a thick crescent.

All told, it's a combination of these four factors—distance, size, albedo, and the phase-determined illuminated area—that determine how bright a planet appears to us, and all four need to be taken into account to explain our observations.

Don't fret if you missed the Venus-Jupiter conjunction; three more big, bright, close ones are coming up later this year in the eastern pre-dawn sky: Mars-Jupiter on October 17, Venus-Jupiter on October 26, and Venus-Mars on November 3.

Keep watching the skies, and enjoy the spectacular dance of the planets!

Image credit: E. Siegel, using the free software Stellarium (L); Wikimedia Commons user TimothyBoocock, under a c.c.-share alike 3.0 license (R). The June 30th conjunction (L) saw Venus and Jupiter pass within 0.4° of one another, yet Venus always appears much brighter (R), as it did in this image from an earlier conjunction.

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.