

PRIMEFOCUS

Tri-Valley Stargazers



May 2018



Meeting Info Preventing an Asteroid Extinction

Who:
Dr. Kirsten Howley

When:
May 18, 2018
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

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May Meeting

Preventing an Asteroid Extinction Dr. Kirsten Howley-Lawrence Livermore National Laboratory

Earth impacts from asteroids represent a very low probability, but potentially catastrophic threat. As part of a national planetary defense collaboration, NNSA and NASA are working to develop methods to mitigate impact threats. The HAMMER, a single, multi-purpose tool has been proposed by the collaboration as a versatile tool



Caption: Our Indian guide tells us of the cultural, historical, and scientific significance of Meteor Crater, AZ. Credit: Ken Sperber

that can accomplish a deflection or disruption scenario should the need arise. The preferred approach would be to deflect an asteroid by ramming a kinetic impactor (rocket) into it. When the asteroid is large or the warning time is short, an alternate method would be to deliver a gentle nudge using a nuclear explosion or to bury the explosive on or beneath the asteroid surface in an attempt to break it apart.

Dr. Kirsten Howley is a physicist on the Lawrence Livermore National Laboratory (LLNL) planetary defense team. She derives analytic equations and leverages large-scale computing systems (supercomputers) to simulate asteroid deflection scenarios, with a focus on the effectiveness of standoff nuclear explosions to alter the speed – and thus orbital timing – of potential threats. In addition to her planetary defense work, she is involved in modeling and executing hydrodynamic experiments important to assessing the safety, security and effectiveness of explosive devices related to national security.

Kirsten holds a Ph.D. and M.S. in astronomy and astrophysics from UC Santa Cruz, and a B.A. in physics and astrophysics from UC Berkeley. She joined LLNL as a graduate student summer intern in 2007, worked as a postdoc and was hired onto the staff in 2013. She was the first of what has become numerous staff members who got their start at LLNL as postdocs and graduate interns conducting planetary defense research.

News & Notes

2018 TVS Meeting Dates

Below are the TVS meeting dates for 2018. 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
May 18	May 21	
Jun. 15	Jun. 18	May 25
Jul. 20	Jul. 23	Jun. 29
Aug. 17	Aug. 20	Jul. 27
Sep. 21	Sep. 24	Aug. 31
Oct. 19	Oct. 22	Sep. 28
Nov. 16	Nov. 19	Oct. 26
Dec. 21	Dec. 17	Nov. 30

Money Matters

As of the last Treasurer's Report on 04/23/18, our club's checking account balance is \$17,098.09.

Outreach Star Parties

Tuesday, 05/15/18: Outreach star party at the Muslim Community Center, 5724 W Las Positas Blvd., Pleasanton; 7:45pm

Monday, 06/25/18: Outreach star party at the Taylor Family Foundation Camp; 8:00pm

Please contact Eric Dueltgen for further information about the Outreach Star Parties.

Club Star Party

Saturday, 06/16/18: TVS club star party at Tesla Winery, 5143 Tesla Road, Livermore; 8:00pm

H2O Open House Reports



Image Caption: Attendees at the May 5 H2O Open House. Image Credit: Ross Gaunt

H2O Reports (continued)

Roland Albers reported that the weather didn't look very promising as people gathered at Mines and Tesla for the 6:30 departure, but later the clouds thinned out enough at H2O for an enjoyable full evening of observing. While Roland indicated that the seeing proved decent, Chuck Grant reported that the clouds were lit up pretty brightly by city lights, especially towards the central valley.

About a dozen cars were in the caravan to H2O. The crowd included both new and seasoned club members, plus a guest who traveled all the way from the UK! Days prior to the club H2O open house, club secretary Ron Kane received an email from Mark Chamberlain, who was visiting family in Livermore and asked if he could be sponsored to visit H2O during the open house. Mark is the chairman of the Herefordshire Astronomical Society and the global moderator for <http://www.stargazerlounge.com>. Ross agreed to host Mark at the Open House. Being from 57 degrees north, Mark was hoping to see M83 (Seashell Galaxy) and some of Centaurus, which are difficult to see from his observing site in the UK. While there were low clouds to the south during the open house, we were able to observe M83 as well as Centaurus A, but Omega-Centauri was 'obscured by clouds' (what a great name for a rock album, someone should mention this to Pink Floyd).

Roland's impression was that everyone enjoyed sharing views through the three or four telescopes that were set-up. He found Jupiter particularly stunning, both in the club's 17.5-inch Jack Marling Newtonian telescope and in his 15x70 binoculars. Through the club scope Chuck gave fantastic views of Jupiter and its 4 Galilean moons, M95, M96, and the Leo triplet (M65, M66, NGC 3628). Using his 9.25" Celestron telescope, Ross noted observing M63, M94, NGC 4485, NGC 4490, M13-including the Propeller, M92, NGC 2903, NGC 4038, NGC 4039, NGC 4361, M104 (Sombrero Galaxy), M57, M53, M64, M3, M97 NGC 4656, NGC 4631, and Jupiter.

Vishwa Theja emailed that he had a wonderful time star gazing. His favorite moments were spotting an Iridium flare and watching Jupiter and its four moons. Using an iPhone Vishwa took the image of Jupiter, seen on p.3, through an eyepiece mounted on the club 17.5" telescope.

Matt T. reported that the drive was beautiful and though he had to leave early he was happy to have finally visited the site after hearing about it for years. On the drive home he had a great look at a bobcat, leisurely crossing Mines Road a few miles north of the H2O gate.

Craig Mullins reporting that the car in front of him drove into an embankment. He stopped finding that all was fine, and with the accident not involving anyone (or a guest) of TVS.

Header Image: The Holsinger meteorite, the largest fragment of the 150-foot meteor that created Meteor Crater. Image Credit: Ken Sperber

H2O Reports (continued)



Image Caption: Vishwa Theja took this image of Jupiter using his iPhone through the club 17.5" telescope.

Special thanks to Chuck Grant for again hosting a successful Open House. Chuck led the caravan to the site, coordinated parking on arrival, conducted orientations for several new keyholders, entertained the crowd with stories about the history of the location, manned the club telescope to share views of Jupiter, star clusters, galaxy groupings, and more, and then closed the gates behind the caravan on the way out just after midnight.

Excited by the prospect of improved conditions, on Monday, May 7 Ross and Mark (from the UK) went to H2O once again. While waiting for Omega Centauri to rise, they observed several other targets. By 10PM they got a brilliant view of Omega-Centauri in the Celestron and with the Jack Marling telescope. They also got an excellent view of Jupiter and the Red Spot in the Jack Marling using the 13mm eyepiece. By the

end of the evening Mark and Ross observed NGC 2371, NGC 2372, NGC 2392 (Eskimo Nebula), M68, M83 (Southern Pinwheel Galaxy), NGC 3115 (Spindle Galaxy), NGC 3242 (Ghost of Jupiter), M67, M95, M96, M105, NGC 3384, NGC 3607, NGC 3608, M13, NGC 6207, M12, M10, M14, M4, M80, M9, NGC 5128 (Centaurus A), NGC 5139 (Omega Centauri), NGC 4038 and NGC 4039 (Antennae Galaxies).

The reports were contributed by Roland Albers, Chuck Grant, Vishwa Theja, Matt T., Craig Mullins, and Ross Gaunt.



Image Caption: Mark Chamberlain, visiting from the UK, and Ross Gaunt at H2O on May 7. Image Credit: Ross Gaunt

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TVS E-Group

To join the TVS e-group 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

May 14, 7:30pm (Also May 15 at Foothill for \$3)

What: Chasing New Horizons: Inside the Epic First Mission to Pluto
Who: Alan Stern (PI of NASA's New Horizons mission) and David Grinspoon (Astrobiologist)
Where: California Academy of Sciences, 55 Music Concourse Dr., Golden Gate Park, San Francisco, CA
Cost: Advanced ticketing required. Academy members \$12, Seniors \$12, General \$15. Reserve a space online or call 1-877-227-1831.

On July 14, 2015, something amazing happened. More than 3 billion miles from Earth, a small NASA spacecraft called New Horizons screamed past Pluto at more than 32,000 miles per hour, focusing its instruments on the long mysterious icy worlds of the Pluto system, and then, just as quickly, continued on its journey out into the beyond. Nothing like this has occurred in a generation—a raw exploration of new worlds unparalleled since NASA's Voyager missions to Uranus and Neptune—and nothing quite like it is planned to happen ever again. At a time when so many think that our most historic achievements are in the past, the most distant planetary exploration ever attempted not only succeeded in 2015 but made history and captured the world's imagination.

How did they do it? Mission Leader Dr. Alan Stern and co-author Dr. David Grinspoon share the ultimate insider's look at this amazing mission. It is the story of decades-long commitment and persistence; political fights within and outside of NASA; and sheer human ingenuity in designing, building, and flying the mission. And Dr. Stern will give a preview of New Horizons' next encounter, as it performs a flyby of MU69 in the Kuiper Belt, 1 billion miles past Pluto, in 2019.

Copies of Dr. Stern's and Dr. Grinspoon's new book "Chasing New Horizons" will be available for purchase and signing following the presentation.

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

May 15, 7:00pm

What: Chasing New Horizons: Inside the Epic First Mission to Pluto
Who: Alan Stern (PI of NASA's New Horizons mission) and David Grinspoon (Astrobiologist)
Where: Smithwick Theatre, 12345 El Monte Road, Los Altos Hills, CA 94022
Cost: Free, \$3 parking (Credit Cards or \$1 dollar bills)

See description from May 14 California Academy Presentation.

For more information see: <https://foothill.edu/astronomy/> or phone 650-949-7888.

May 15, 7:30pm-10:00pm

What: SJJA Imaging SIG Meeting
Who: San Jose Astronomical Society
Where: Hogue Park, 3972 Twilight Drive, San Jose, CA (first bldg. closest to parking lot and tennis courts)
Cost: Free

The Imaging SIG meets roughly every month at Hogue Park to discuss topics about imaging. The SIG is open to people with absolutely no experience but want to learn what it's all about, but experienced imagers are also more than welcome, indeed, encouraged to participate.

For more information see: <https://www.meetup.com/SJ-Astronomy/events/249387941/> and www.sjaa.net/calendar/

May 19, 8:00pm

What: Is That Deep Glow in the Night Sky Real?
Who: Laura Peticolas, Sonoma State University
Where: Mt. Tamalpais State Park, Cushing Memorial Amphitheater, more commonly known as the Mountain Theater, Rock Spring parking area
Cost: Free

The Northern Lights can appear as a deep red glow here in California. In Alaska, it more often appears as a bright green band, glowing across the night sky. Come learn more about these dynamic lights, their connection to the activity on the Sun, and how photographers are helping us better understand the difference ways these lights are manifested.

For more information see: <http://www.friendsofmontam.org/astronomy/schedule>

May 23, 7:00pm

What: HAL's Legacy: 2001's Computer as Dream and Reality
Who: David Stork
Where: SRI Conference Center, 333 Ravenswood Ave., Menlo Park, CA 94205 (Enter from Middlefield Rd.)
Cost: Free, Due to popularity of SETI events, registration in advance is strongly suggested

Along with celebrating 50 years of software engineering, we can also celebrate the premiere of one of the most famous science fiction movies in history, 2001: A Space Odyssey. One of the central characters in the movie was the supercomputer HAL, the most powerful computer imagined at that time. Possessed knowledge superior to that of a human, HAL controlled the spaceship, found solutions to the most complex problems, played chess with the astronauts, and served them continuously. Then something went wrong. Why? Was it a bug in the system, or a problem intrinsic to AI? This is the core question.

50 years later, we might frame the questions differently: Would it be possible to design a computer today that could reach or outreach HAL's capabilities? Can today's software do
continued on p.5

Calendar of Events (continued)

what HAL did? What are the ethical questions and dangers of AI in such a context?

In this interactive talk Dr. David Stork will discuss these questions and explore the ethical concerns and potential deep dangers of artificial intelligence.

Dr. David G. Stork works in pattern recognition, machine learning, computer vision and computational sensing and imaging. He is a graduate in physics from MIT and the University of Maryland and has held faculty positions in Physics, Mathematics, Computer Science, Electrical Engineer, Statistics, Neuroscience, Psychology and Art and Art History variously at Wellesley and Swarthmore Colleges and Clark, Boston and Stanford Universities. Dr. Stork is a Fellow of IEEE, the Optical Society of America, SPIE, the International Association for Pattern Recognition, the International Academy, Research and Industry Association, the Society for Imaging Science and Technology, and a Senior Member of the Association for Computing Machinery.

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

June 1, 6:00pm-10:00pm

What: \$5 First Fridays

Who: You

Where: Chabot Space and Science Center, 10000 Skyline Blvd., Oakland, CA 94619

Cost: \$5; <http://www.chabotspace.org/first-fridays.htm>

No details available.

Pre-purchase your tickets for \$5 First Friday at: <http://www.chabotspace.org/first-fridays.htm> or for more information, call (510) 336-7373.

June 4, 7:30pm

What: Are We Alone in the Universe?

Who: Lisa Kaltenegger, Director, Carl Sagan Institute, Cornell University

Where: California Academy of Sciences, 55 Music Concourse Dr., Golden Gate Park, San Francisco, CA

Cost: Advanced ticketing required. Academy members \$12, Seniors \$12, General \$15. Reserve a space online or call 1-877-227-1831.

The detection of thousands exoplanets orbiting other alien Suns has revolutionized our view of the cosmos. With the next generation of telescopes we will be able to peer into the atmospheres of rocky planets and get a glimpse into other worlds. In this lecture Dr. Kaltenegger shows the latest results and explores how we can determine which of these exoplanets might be suitable for life. She will discuss techniques and missions that could detect life on these worlds, finally answering the question, "Are we alone in the Universe?"

Lisa Kaltenegger is director of the Carl Sagan Institute at Cornell University and an associate professor in Cornell's astronomy department. Her research focuses on exploring worlds around alien Suns and searching for signs of life. Her awards include the 2014 Doppler Prize for Innovation in Science and the 2012 Heinz Maier-Leibnitz Prize for Physics. She was named an innovator to watch by TIME, a Role Model for Women in Science and Research by the European Commission, and one of America's Young Innovators by Smithsonian Magazine. She is featured in the new IMAX movie "Search for Life in space". Asteroid 7734 Kaltenegger is named after her.

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

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

All times are Pacific Daylight Time

May

- 8 Tue Jupiter reaches opposition, visible all night
- 15 Tue **New Moon (4:48am)**
- 17 Thu Waxing crescent Moon and Venus separated by $\sim 6^\circ$ (Dusk)
- 19 Sat The Moon is 6° below M44, the Beehive Cluster
- 20 Sun Venus less than 1° from the Open Star Cluster M35 in Gemini
- 21 Mon **First-Quarter Moon (8:49pm)**
- 25 Fri The Moon and Spica $\sim 6^\circ$ apart
- 26 Sat The Moon and Jupiter form a triangle with Spica
- 29 Tue **Full Moon (7:19am)**
- 31 Thu The Moon and Saturn rise $\sim 2^\circ$ apart, with the separation growing to $\sim 4^\circ$ by sunrise

June

- 1 Fri The waning gibbous Moon is $\sim 3^\circ$ from Saturn in Sagittarius (Early Monrnig)
- 3 Sun The Moon and Mars are $\sim 3^\circ$ apart in the east-southeast (Early Monrnig)
- 6 Wed **Last-Quarter Moon (11:32am)**
- 10 Sun Venus, Castor, and Pollux lined up and set in the west (Evening)
- 13 Wed **New Moon (12:43pm)**
- 15 Fri In the northwest, Mercury begins to emerge from the glare of the Sun (Dusk)
- 16 Sat The crescent Moon is $\sim 8^\circ$ from Venus, with M44, the Beehive Cluster, halfway between
- 17 Sun The Moon leads Regulus by $\sim 3^\circ$ as they set in the west
- 19-20 Tue- Vesta at opposition, 5.3mag, visible all night
- 20 Wed **First-Quarter Moon (3:51am)**
- 22 Fri The Moon and Jupiter $\sim 4.5^\circ$ apart in Libra
- 27 Wed **Full Moon (9:53pm)**
- 27-28 Wed- Saturn a opposition with rings tilted near maximum extent; with Full Moon only about 1° away!

What's It Like Inside Mars?

By Jessica Stoller-Conrad

Mars is Earth's neighbor in the solar system. NASA's robotic explorers have visited our neighbor quite a few times. By orbiting, landing and roving on the Red Planet, we've learned so much about Martian canyons, volcanoes, rocks and soil. However, we still don't know exactly what Mars is like on the inside. This information could give scientists some really important clues about how Mars and the rest of our solar system formed.



This spring, NASA is launching a new mission to study the inside of Mars. It's called Mars InSight. InSight—short for Interior Exploration using Seismic Investigations, Geodesy and Heat Transport—is a lander. When InSight lands on Mars later this year, it won't drive around on the surface of Mars like a rover does. Instead, InSight will land, place instruments on the ground nearby and begin collecting information.

Just like a doctor uses instruments to understand what's going on inside your body, InSight will use three science instruments to figure out what's going on inside Mars.

One of these instruments is called a seismometer. On Earth, scientists use seismometers to study the vibrations that happen during earthquakes. InSight's seismometer will measure the vibrations of earthquakes on Mars—known as marsquakes. We know that on Earth, different materials vibrate in different ways. By studying the vibrations from marsquakes, scientists hope to figure out what materials are found inside Mars.

InSight will also carry a heat probe that will take the temperature on Mars. The heat probe will dig almost 16 feet below Mars' surface. After it burrows into the ground, the heat probe will measure the heat coming from the interior of Mars. These measurements can also help us understand where Mars' heat comes from in the first place. This information will help scientists figure out how Mars formed and if it's made from the same stuff as Earth and the Moon.

Scientists know that the very center of Mars, called the core, is made of iron. But what else is in there? InSight has an instrument called the Rotation and Interior Structure Experiment, or RISE, that will hopefully help us to find out.

Although the InSight lander stays in one spot on Mars, Mars wobbles around as it orbits the Sun. RISE will keep track of

InSight's location so that scientists will have a way to measure these wobbles. This information will help determine what materials are in Mars' core and whether the core is liquid or solid.

InSight will collect tons of information about what Mars is like under the surface. One day, these new details from InSight will help us understand more about how planets like Mars—and our home, Earth—came to be.

For more information about earthquakes and marsquakes, visit: <https://spaceplace.nasa.gov/earthquakes>

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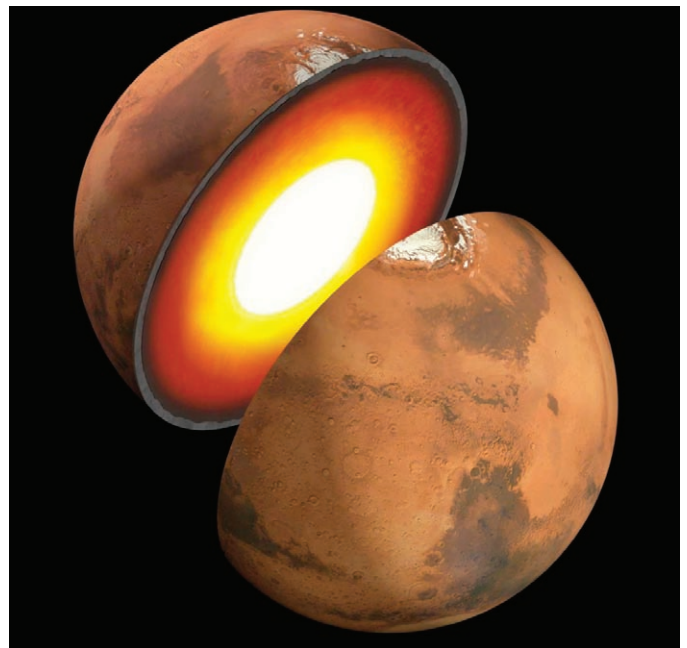


Image Caption: An artist's illustration showing a possible inner structure of Mars. Image credit: NASA/JPL-Caltech



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

Tri-Valley Stargazers Membership Application

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 (\$100). 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.

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 except as detailed in our Privacy Policy (www.trivalleystargazers.org/privacy.shtml).

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