

# PRIMEFOCUS

Tri-Valley Stargazers



November 2016



## Meeting Info

### What:

The History of  
Astronomical Imaging

### Who:

Dr. Lance Simms

### When:

November 18, 2016  
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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## November Meeting

### The History of Astronomical Imaging

#### Dr. Lance Simms

Most people know that Galileo revolutionized the field of astronomy when he pointed a telescope up at the heavens in 1610. What is not as widely known is that a similar revolution occurred when John William Draper first moved away from the human eye as the primary astronomical sensor in 1840 and used photographs instead. In this talk, I will give a brief overview of the history of astronomical imaging and the incredible impact it has had in the fields of astronomy, astrophysics, and cosmology. Along the way, I will delve into a bit of detail on how modern Charge Coupled Devices and CMOS imagers work.

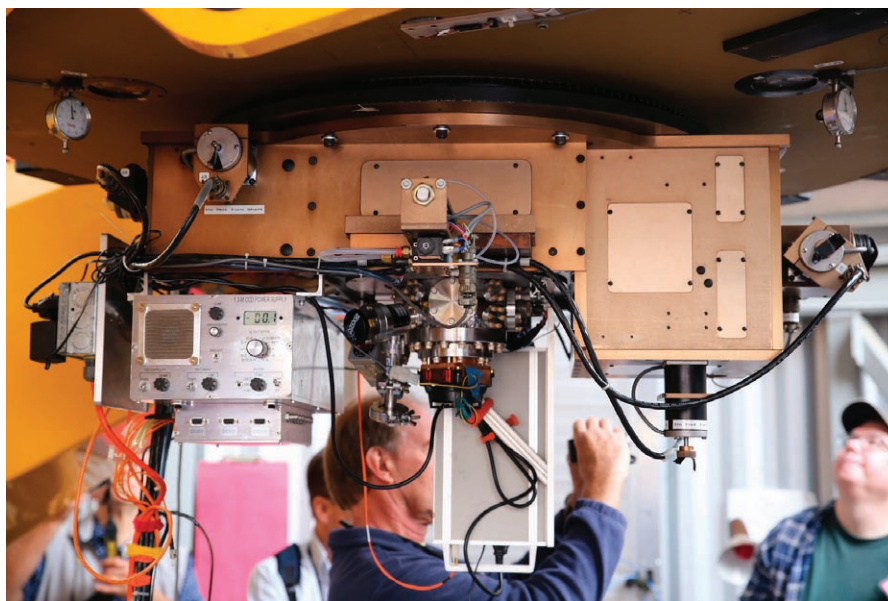


Image Caption: The 48 megapixel CCD camera and instrument package on the 1.3m telescope at the Naval Observatory Flagstaff. The camera has the capability to track both stars and satellites at the same time by actively shifting the charge on the CCD while tracking.  
Image Credit: Ken Sperber

Lance Simms is a physicist/engineer at Lawrence Livermore National Laboratory. He received a BS in Physics from University of California: Santa Barbara in 2003 and a PhD in Applied Physics from Stanford in 2009. His PhD work focused on the application of Hybrid CMOS imagers in astronomy. Nowadays he loves working with whatever detectors he can get his hands on (infrared, visible, X-ray, you name it), and currently characterizes and programs imagers for optical payloads in small satellites.

## News & Notes

### 2016/2017 TVS Meeting Dates

The following lists the TVS meeting dates for 2016 and 2017. 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. 18	Nov. 21	
Dec. 16	Dec. 19	Nov. 25
Jan. 20	Jan. 23	Dec. 30
Feb. 17	Feb. 20	Jan. 27
Mar. 17	Mar. 20	Feb. 24
Apr. 21	Apr. 24	Mar. 31
May 19	May 22	Apr. 28
Jun. 16	Jun. 19	May 26
Jul. 21	Jul. 24	Jun. 30
Aug. 18	Aug. 21	Jul. 28
Sep. 15	Sep. 18	Aug. 25
Oct. 20	Oct. 23	Sep. 29
Nov. 17	Nov. 20	Oct. 27
Dec. 15	Dec. 18	Nov. 24

### Money Matters

As of the last Treasurer's Report on 10/24/16, our club's checking account balance is \$12,813.16.

### TVS Elections in November

TVS will hold its annual election at the November 18 meeting. Chuck Grant will present the slate of candidates, and election is by acclamation. The present nominations are:

- President: Rich Combs
- Vice President: Eric Dueltgen
- Treasurer: Roland Albers
- Secretary: Joy Milsom

Additional nominations can be voiced at the meeting.

Chuck Grant has decided to step down as President of TVS. Please thank him for his many years of dedicated service. He will continue as Observatory Director.

### Outreach Star Party: Request for Assistance

Eric Dueltgen is looking for volunteers to bring telescopes and/or binoculars to the following Outreach Star Party:

Wednesday, December 7th, 6:30 to 8:00pm: Sunset Elementary School, 1671 Frankfurt Way, Livermore

This outreach star party will coincide with the school's Family Science Night.

## Calendar of Events

### November 15, 12:00pm

What: Latest Exoplanet Results from NASA's Kepler/K2 Mission  
Who: Ian Crossfield, UC Santa Cruz  
Where: SETI Institute Colloquium, Microsoft Silicon Valley Campus (Galileo Room), 1065 La Avenida St., Mountain View, CA  
Cost: Free

No details available.

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

### November 16, 17, 23, and 30, 2:30pm-

What: Dawn of the Space Age  
Who: Chabot Ask Jeeves Planetarium  
Where: Chabot Space and Science Center, 10000 Skyline Blvd., Oakland, CA 94619  
Cost: Chabot Admission \$18 Adults, \$14 Youth, \$15 Seniors, Free for Members

Just as the Space Race began, Dawn of the Space Age starts with the launch of Sputnik and includes important Russian space history as well as the American Gemini, Apollo and Shuttle programs. The show transports viewers to the International Space Station, the X-prize winning private space ship and on to future Mars exploration.

Be immersed and overwhelmed with this most accurate historic reconstruction of Man's first steps into space. Who were these men and women that took part in these dangerous, heroic endeavors? Witness their drive, their passion, and their perseverance to explore, in this epic realistically animated production.

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

### November 22, 12:00pm

What: How Galaxies are Influenced by the Largest Structures in the Universe  
Who: Mehmet Alpaslan, NASA Ames Research Center  
Where: SETI Institute Colloquium, Microsoft Silicon Valley Campus (Galileo Room), 1065 La Avenida St., Mountain View, CA  
Cost: Free

When viewed at the largest scales, the distribution of galaxies in the Universe resembles a complex, tangled web: an interconnected network of filaments of galaxies that surround vast, empty voids. Simulations and theory have established

Header Image: TVS President Chuck Grant (center) posing with the telescope that Clyde Tombaugh used to discover Pluto at Lowell Observatory. Image Credit: Gert Gottschalk

that filaments – the largest, most densely populated structures in the Universe - have formed in the billions of years after the Big Bang, and serve as conduits for transporting gas into galaxies, which they then turn into stars. Thanks to advances in telescope instrumentation the current generation of galaxy surveys is finally able to observe the night sky in sufficient detail as to accurately map the Cosmic Web for the first time, and begin to understand the role it plays in influencing the evolutionary fate of galaxy.

In this talk, Dr. Alpaslan will review advances in mapping out the filamentary network of the Universe using data from the Galaxy And Mass Assembly (GAMA) survey, as well as discuss some recent advances in understanding how the galaxies that live in dense filament differ from those that exist alone in isolated voids.

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

### November 29, 12:00pm

**What:** On Some Recent Progress on Planet Formation Theory  
**Who:** Doug Lin, UC Santa Cruz  
**Where:** SETI Institute Colloquium, Microsoft Silicon Valley Campus (Galileo Room), 1065 La Avenida St., Mountain View, CA  
**Cost:** Free

No details available.

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

### December 5, 7:30pm

**What:** Truth and Beauty in Astronomy Visualization  
**Who:** Dr. Frank Summers, Space Telescope Science Institute  
**Where:** California Academy of Science, 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.

In the development of astronomy imagery for the public, the scientific emphasis on fidelity can often seem at cross-purposes to artistic expression. As an astrophysicist who creates visualizations, Dr. Summers not only confronts this dichotomy daily, but also delights in the challenge of combining accuracy and aesthetics. This talk will showcase compelling visuals and describe techniques used in creating sequences for educational materials, press releases, planetarium shows, and IMAX films. Come experience the transformation of Hubble images and data into cinematic sequences, with an emphasis on the compromises made and the flourishes enabled when paying homage to the twin ideals of truth and beauty.

See [www.calacademy.org/events/benjamin-dean-astronomy-lectures](http://www.calacademy.org/events/benjamin-dean-astronomy-lectures) for lecture and reservation information.

### December 17, 11:00am

**What:** Cosmic Microwave Background  
**Who:** Adrian Lee,  
**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.

No details available.

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

<p><b>Officers</b></p> <p><b>President:</b>            Chuck Grant  <a href="mailto:president@trivalleystargazers.org">president@trivalleystargazers.org</a></p> <p><b>Vice-President:</b>            Rich Combs  <a href="mailto:vice_president@trivalleystargazers.org">vice_president@trivalleystargazers.org</a></p> <p><b>Treasurer:</b>            Roland Albers  <a href="mailto:treasurer@trivalleystargazers.org">treasurer@trivalleystargazers.org</a></p> <p><b>Secretary:</b>            Jill Evanko  <a href="mailto:secretary@trivalleystargazers.org">secretary@trivalleystargazers.org</a></p>	<p><b>Volunteer Positions</b></p> <p><b>AANC Representative:</b>            unfilled</p> <p><b>Astronomical League Representative:</b>            Dennis Beckley  <a href="mailto:alrep@trivalleystargazers.org">alrep@trivalleystargazers.org</a></p> <p><b>Historian:</b>            Hilary Jones  <a href="mailto:historian@trivalleystargazers.org">historian@trivalleystargazers.org</a></p> <p><b>Loaner Scope Manager:</b>            John Swenson  <a href="mailto:telescopes@trivalleystargazers.org">telescopes@trivalleystargazers.org</a></p> <p><b>Newsletter Editor:</b>            Ken Sperber  <a href="mailto:newsletter@trivalleystargazers.org">newsletter@trivalleystargazers.org</a>            925-361-7435</p>	<p><b>Observatory Director/ Key Master:</b>            Chuck Grant  <a href="mailto:h2o@trivalleystargazers.org">h2o@trivalleystargazers.org</a></p> <p><b>Program Director:</b>            Rich Combs  <a href="mailto:programs@trivalleystargazers.org">programs@trivalleystargazers.org</a></p> <p><b>Publicity Coordinator:</b>            Andy Coutant  <a href="mailto:publicity@trivalleystargazers.org">publicity@trivalleystargazers.org</a></p> <p><b>Refreshment Coordinator:</b>            Laurie Grefsheim</p> <p><b>Star Party Coordinator:</b>            Eric Dueltgen  <a href="mailto:coordinator@trivalleystargazers.org">coordinator@trivalleystargazers.org</a></p> <p><b>Webmaster:</b>            Hilary Jones  <a href="mailto:webmaster@trivalleystargazers.org">webmaster@trivalleystargazers.org</a></p>	<p><b>Web &amp; E-mail</b>  <a href="http://www.trivalleystargazers.org">www.trivalleystargazers.org</a>  <a href="mailto:info@trivalleystargazers.org">info@trivalleystargazers.org</a></p> <p><b>TVS E-Group</b>            So how do you join the TVS e-group, you ask? Just send an e-mail message to the TVS e-mail address (<a href="mailto:info@trivalleystargazers.org">info@trivalleystargazers.org</a>) asking to join the group. Make sure you specify the e-mail address you want to use to read and post to the group.</p>
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## Travelogue By Ken Sperber

### Lowell Observatory: 25th Meeting of the Antique Telescope Society

At the September TVS meeting, Ken Lum, our presenter, mentioned that the Antique Telescope Society (ATS) would be holding its 2016 annual meeting at Lowell Observatory. Having never been to Lowell Observatory I immediately registered. The meeting also appealed to Chuck and Gert, and together we carpoled from Phoenix to Flagstaff, with Chuck serving valiantly as the navigator.

The ATS club members were very welcoming to all, including first time attendees, such as myself. The inaugural speaker was Ralph Nye, Director of Technical Services at Lowell. With passion, Ralph talked about his 40 years of service at Lowell Observatory, including the many instruments he helped design and the science they facilitated, such as the discovery of the Uranian rings and the atmosphere of Pluto while observing occultations of stars using photometers. While touring the machine shop of Lowell the next day, we saw the NASA SOFIA high speed photometer that he helped construct.



Ralph Nye giving a tour of the recently restored 24" Clark Refractor at Lowell Observatory. Image Credit: Ken Sperber

Ralph was omnipresent throughout the meeting, including giving the ATS attendees a private tour of the 24" Clark refractor. The Clark, newly restored, was commissioned in 1895 and is famous for being the telescope that Percival Lowell used to study surface features on Mars, including the supposed Canali that he suggested were constructed by intelligent beings. Bill Sheehan, a local scholar on the history of astronomy, gave the featured presentation at the meeting banquet and suggested the possibility that the Canali were actually an artifact of perception, being the fine blood vessels of the retina that we sometimes perceive when a bright light is shined in your dilated eye. Bright planet in a 24" telescope at a dark site at 7200 ft. elevation -- seems possible to me.

Kevin Schindler (Lowell Historian and Media Relations) and Klaus Brasch (Lowell Volunteer) also presented overviews of the history and the scientific legacy of the 24" Clark Refractor

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## Member Astrophotos



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Andy Coutant assembled this montage of the Orion region using 4 images that overlapped by about 30% each. At the top the Flame Nebula is visible, as is the Horsehead Nebula. Below is the Running Man Nebula and the Orion Nebula. Each exposure was ~30-40 minutes in duration using a fully modified Canon 600D with an Orion imaging filter on a Celestron CPC 11" edgeHD telescope. He used the Hyperstar system which gave a focal length of 540mm at f/2! Guiding was done using a Celestron 80mm guide scope with an Orion Starshoot Pro mono guide camera. The images were taken at about the 18 mile mark of Mines Road.

## Member Astrophotos (continued)



NGC253, as imaged by Dave Childree at H20 on September 29. The sky conditions were excellent, and by midnight the fog snuffed out the San Jose, Livermore, and Gilroy lights. Dave used a SBIG STL-11000M imaging camera on his 18" f/4.5 Newtonian telescope. The LRGB subframes were 10 x 2 minutes for each channel. For more of his images and information on his setup, see: <http://www.mezzoscope.com/index.html>

## Travelogue (continued)

and the other telescopes on the mountain. I did not know that while Pluto was discovered in 1930, it was imaged during an earlier search at Lowell in 1915 using a 9" Brashear Telescope. Though Pluto was overlooked on this earlier plate, its position helped refine the calculation of the orbit of Pluto. Over the years the latest photographic equipment and techniques were used at the 24" Clark. For example, Jupiter and Saturn were imaged using various filters to isolate different aspects of the atmosphere. Also, as part of the Planetary Patrol Program, using scopes around the world to monitor the major planets 24/7, Lowell was instrumental in the discovery that the Venus atmosphere exhibits retrograde rotation. Other techniques pioneered at Lowell include stacking images to improve the signal-to-noise ratio (V. Slipher). The 24" Clark was also instrumental in the Apollo program. Observations at the eyepiece were superior to grainier film images of the Moon, and allowed for geological interpretation of the lunar surface by luminaries such as Gene Shoemaker. These interpretations were instrumental in the selection of Apollo landing sites.

ATS attendees were privileged to observe on the 24" Clark telescope on Friday and Saturday nights. We saw M15,

which exhibited numerous red stars toward its core, Triton and Oberon were seen adjacent to Uranus, with Chuck being able to see a total of 5 moons! M51 presented its well-defined spiral arms, and M2, another Globular Cluster, looked like diamond dust on black felt. M1, the Crab Nebula was less well-defined, and for me the Planetary Nebula NGC7662, the Blue Snowball, was the best. The central star was initially visible, but the the well-defined ring and the extended nebulosity dominated.

Presentations were given on other observatories, including the Schanck Observatory at Rutgers University. Barry Malpas indicated the observatory dates back to 1866 when it was equipped with a 6.5" Fitz equatorial refractor. Two other telescopes have called the Schanck Observatory home: a Prin and a Hastings-Byrne that was used to observe the 1882 Venus Transit of the Sun. In the 1960's the observatory fell into disrepair, but efforts to restore the building and its remaining telescope have advanced in anticipation of the observatory's 150th Anniversary.

The history of two other observatories, the Old Manila Observatory and the Great Melbourne Telescope were heart-wrenching stories. Pat Seitzer described the founding of the Old Manila Observatory which became opera-

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

All times are Pacific Standard Time.

### November

- 14 Mon Full Moon (5:52am)
- 17 Thu The weak Leonid meteor shower peaks before dawn, but the Moon will wash out all but the brightest meteors
- 21 Mon Last-Quarter Moon with Regulus 2 degrees above (00:33am)
- 25 Fri The crescent Moon, Jupiter, and Spica form a triangle about 9 degrees tall in the southeast (Dawn)
- 25 Fri Algol at minimum brightness for 2 hours centered at 9:13pm
- 29 Tue New Moon (4:18am)

### December

- 3 Sat Crescent Moon about 7 degrees above or to the upper-left of Venus (Evening)
- 4 Sun The Moon is ~6 degrees right of Mars (Dusk)
- 7 Wed First-Quarter Moon (1:03am)
- 12 Mon The dark limb of the Moon occults Aldebaran beginning at ~7:06pm, reappearing at ~8:05pm
- 13-14 Tue- The Geminid meteor shower peaks on the evening of December 13, but the Moon will wash out all but the brightest meteors
- 13 Tue Full Moon (4:05pm)

tional in 1899 with a 20" Merz/Saegmuller refractor. Unfortunately, the observatory was cursed by its location. Firstly, it was located near sea-level in the tropics, which made for a moist and cloudy environment, severely limiting the science that could be performed. Secondly, and lastly, it was destroyed in 1945 during WWII. The image of the battered observatory was a sad sight, and it is said that the objective lens melted into the shape of a teardrop.

Barry Adcock presented on the reconstruction of the Great Melbourne Telescope. The original Cassegrain telescope was constructed by Thomas Grubb of Dublin and commissioned in 1869. The 48" speculum mirror was later replaced by a 50" borosilicate glass mirror. In 1950 the telescope was sold and relocated to Mt. Stromlo, where it served faithfully until its destruction in a 2003 bush fire. All that remained was the cast iron and steel skeleton of the telescope. Since 2008, volunteers of the Astronomical Society of Victoria and the Museum-Victoria have been working to restore the telescope to its former glory, including making replica Huygen's Eyepieces. Recently, a \$100,000 grant has been obtained for the purchase of a new mirror. The goal is to have the work completed in time for its 150th anniversary in 2019!

ATS attendees also visited the Naval Observatory Flagstaff, where the Navy operates a 60-inch folded Newtonian Telescope that is used to make differential astrometry measurements. These measurements are needed because the Earth's rotation rate varies due friction between the winds

and the surface. The daily changes are large enough that errors in a ship's location at sea could be about 30m if corrections were not made. We also saw the last telescope designed and built by George Ritchey, a 40" telescope in a snug fitting dome. The original mirror was replaced in 1969 with a more modern quartz mirror that has better thermal qualities. There is also a 1.3m modified Ritchey-Chretien that was completed in 1999. It is used for astrometry, the study of giant stars, and the dynamics of multiple star systems.

The group also visited the Lowell Observatory Discovery Channel Telescope, which is a 4.3 meter telescope used to study Kuiper Belt objects, comets, and the evolution and structure of galaxies. After hosting a dinner at his family restaurant, Ralph Nye gave us a tour of his personal observatories, one of which hosts a pair of Brashear(?) astrographs, relics from Lowell Observatory that he rescued and restored over the course of 5 years of passionate work. At his restaurant hang many of the pictures he has taken with these scopes using 8x10 sheet film! As a gift to the ATS attendees, Ralph handed out surplus glass plates of astronomical images taken at Lowell. He rescued these excess plates from the trash, and they became another man's/woman's treasure!

John Briggs, president of the ATS, gave a presentation on his growing telescope collection. He is a real scrapper, stating "Things remain possible in New Mexico if you are a scrounging rat like I am." As it turns out, one of his recent acquisitions has close ties to TVS, but that is a story for another day!

## Is Proxima Centauri's 'Earth-like' Planet Actually Like Earth at All?

By Dr. Ethan Siegel

Just 25 years ago, scientists didn't know if any stars—other than our own sun, of course—had planets orbiting around them. Yet they knew with certainty that gravity from massive planets caused the sun to move around our solar system's center of mass. Therefore, they reasoned that other stars would have periodic changes to their motions if they, too, had planets.



This change in motion first led to the detection of planets around pulsars in 1991, thanks to the change in pulsar timing it caused. Then, finally, in 1995 the first exoplanet around a normal star, 51 Pegasi b, was discovered via the "stellar wobble" of its parent star. Since that time, over 3000 exoplanets have been confirmed, most of which were first discovered by NASA's Kepler mission using the transit method. These transits only work if a solar system is fortuitously aligned to our perspective; nevertheless, we now know that planets—even rocky planets at the right distance for liquid water on their surface—are quite common in the Milky Way.

On August 24, 2016, scientists announced that the stellar wobble of Proxima Centauri, the closest star to our sun, indicated the existence of an exoplanet. At just 4.24 light years away, this planet orbits its red dwarf star in just 11 days, with a lower limit to its mass of just 1.3 Earths. If verified, this would bring the number of Earth-like planets found in their star's habitable zones up to 22, with 'Proxima b' being the closest one. Just based on what we've seen so far, if this planet is real and has 130 percent the mass of Earth, we can already infer the following:

- It receives 70 percent of the sunlight incident on Earth, giving it the right temperature for liquid water on its surface, assuming an Earth-like atmosphere.
- It should have a radius approximately 10 percent larger than our own planet's, assuming it is made of similar elements.
- It is plausible that the planet would be tidally locked to its star, implying a permanent 'light side' and 'dark side'.
- And if so, then seasons on this world are determined by the orbit's ellipticity, not by axial tilt.

Yet the unknowns are tremendous. Proxima Centauri emits considerably less ultraviolet light than a star like the sun; can life begin without that? Solar flares and winds are much

greater around this world; have they stripped away the atmosphere entirely? Is the far side permanently frozen, or do winds allow possible life there? Is the near side baked and barren, leaving only the 'ring' at the edge potentially habitable?

Proxima b is a vastly different world from Earth, and could range anywhere from actually inhabited to completely unsuitable for any form of life. As 30m-class telescopes and the next generation of space observatories come online, we just may find out!

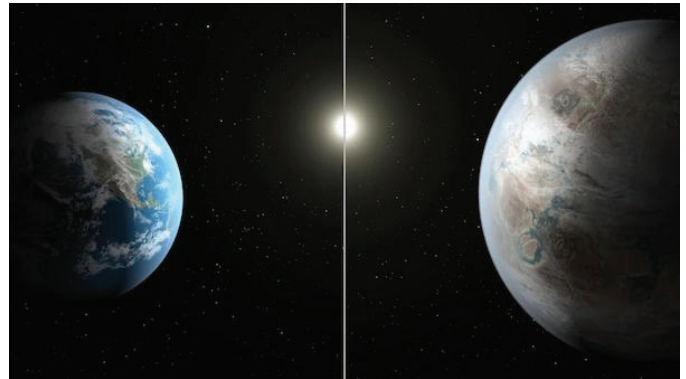


Image caption: An artist's conception of the exoplanet Kepler-452b (R), a possible candidate for Earth 2.0, as compared with Earth (L). Image credit: NASA/Ames/JPL-Caltech/T. Pyle.

Looking to teach kids about exoplanet discovery? NASA Space Place explains stellar wobble and how this phenomenon can help scientists find exoplanets: <http://spaceplace.nasa.gov/barycenter/en/>

This article is provided by NASA Space Place. With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology. Visit [spaceplace.nasa.gov](http://spaceplace.nasa.gov) to explore space and Earth science!



Tri-Valley Stargazers  
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[www.trivalleystargazers.org](http://www.trivalleystargazers.org)

## Tri-Valley Stargazers Membership Application

(or apply for membership online: [www.trivalleystargazers.org/membership.shtml](http://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 (\$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.

**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.