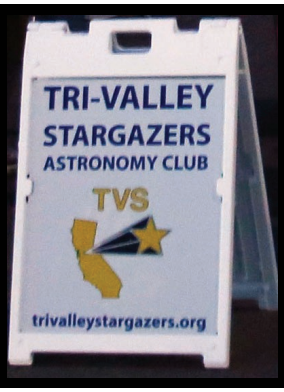
PRIMEFOCUS

Tri-Valley Stargazers



March 2017

Meeting Info
What:
Member Presentations

Who:
YOU, Gert, Roland, Hilary, Swaroop, Ross, Ken, ...

When:
March 17, 2017
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

March Meeting

Member Presentations

This month is the opportunity for club member to share their astronomical experiences through a series of mini-talks (5-10 minutes duration). Numerous presentations have been confirmed; Gert will talk about solar imaging, Roland will talk about eyepieces and exit pupils, Hilary will talk about some of his recent astrophotos, Swaroop will talk about trouble-shooting problems with his Atlas EQ-G mount, Ross will update us on what the NASA Night Sky Network offers our club, and Ken will talk about observing guides. We are seeking other members to discuss their projects or interests. If you are interested in giving a mini-talk, please contact Rich Combs (president"at"trivalleystargazers.org).

TVS Banners

TVS unveiled its new banners at the Livermore Library Citizen Science Day, held February 17. The large banner promotes the benefits of being a member of the Tri-Valley Stargazers, and it includes astrophotos taken by members of the club. The smaller roadside sign, seen in the header image above, is meant to direct the public to our outreach events.

With input from the TVS Board, Rich Combs and Joy Milsom were responsible for the design of the banners. Let's thank them for their fine effort!

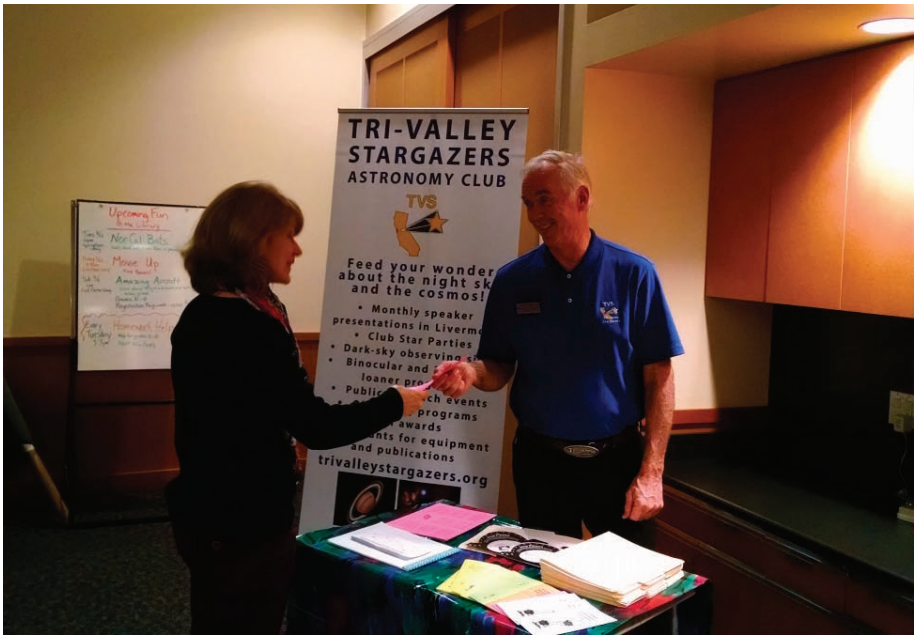


Image Caption: Rich Combs handing a TVS brochure to Regina Brinker, who was the organizer of the Livermore Library Citizen Science Day. Image Credit: Livermore Library Staff

News & Notes

2017 TVS Meeting Dates

The following lists the TVS meeting dates for 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**
Mar. 17	Mar. 20	
Apr. 21	Apr. 24	Mar. 31
May 19	May 22	Apr. 28
Jun. 16	Jun. 19	May 26
Jul. 21	Jul. 24	Jun. 30
August: No General Meeting or Board Meeting		
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 2/20/17, our club's checking account balance is $14,637.28.

TVS Membership Privacy Policy

Roland Albers led the development of a formal TVS Membership Privacy Policy that was approved by the TVS board at their February 20th meeting. The privacy policy, located under the "About" tab on the club website, describes the personal information that TVS collects from its members and the use and safeguarding of this information.

Outreach Star Parties: Request for Assistance

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

Friday March 31: Valley Christian Elementary, Dublin

TVS Outreach Experiences By Rich Combs and Ross Gaunt

The Bankhead Theater: Rich Combs writes that: The Plaza of the Bankhead Theater in downtown Livermore was the site of a micro flash mob, as TVS members Eric Dueltgen, K. Ross Gaunt, Roland Albers, and Rich Combs, with new TVS member John Bush assisting, set up our scopes and awed the public with views of a crescent phase of Venus, 16.8% illuminated, and the Moon, 7.7% illuminated. Initial attendance was sparse, but with a little encouragement, and our new TVS sign prominently placed, there was a steady stream of curious customers, some whom even texted their friends to "come see!" As it became darker, we swung south for views of the Orion nebula, Pleiades, and a few double stars. A great night of sharing the cosmos from the heart of the city!

Sunset Elementary School: Ross Gaunt had a fulfilling experience at this event, writing: We had a wonderful Star Night at Sunset Elementary School in Livermore, Wednesday, March 8. The Tri-Valley Stargazers had a total of 7 telescopes and high-power binoculars set up. We observed Venus, the Pleiades, Mizar & Alcor (a double-binary star system), the Orion Nebula, the Moon--a wide view of the nearly full Moon and a high magnification view of the solar terminator on the Moon. In the multi-purpose room Dan Bergmann set up a dome planetarium which showed nebulae, galaxies, and planets. One feature of the planetarium that thrilled the students and parent viewers was how it could speed up time in the sky very quickly--forward and backward. This allowed the viewers to see the phases of Venus and the Moon, and sunspots move across the Sun. Over the length of the evening, an estimate of more than 100 students and parents came by to take a look through the scopes.

The thing about these star nights, for us in the club, is enabling the public to see the skies through a telescope, perhaps for the first time. Personally, it's so rewarding for a child or adult to look through my telescope and hearing their reaction. I get so many wows, ooohs, and 'cool's. It just makes my day. Then there are the silent ones, they seem to be deeply fascinated. Tonight, one little girl spent about a minute looking at a close up view of the Moon's terminator (258x magnification). She just looked and didn't say anything. She turned so her mother could look, I got a wow. Then the girl put her eye back onto the lens and took in another very long observation. That's the reward the club receives by sharing our telescopes.

The TVS participants at this event were Roland Albers, Tina Chou, Don and Tom Dossa, Eric Dueltgen, Ross Gaunt, Fletcher Goldin, Ron Kane, and Lance Simms.

See page 5 of this newsletter for photos of these two TVS Outreach Star Parties!

Calendar of Events

March 14, 12:00pm

What: A Journey to Alpha Centauri
Who: Christian Marois, University of Victoria
Where: SETI Institute Colloquium, Microsoft Silicon Valley Campus (Galileo Room), 1065 La Avenida St., Mountain View, CA
Cost: Free

The Alpha Centauri star system is ideal to search for habitable planets by various observing techniques due to its proximity and wide range of stellar masses. Following the recent discovery of an Earth-size planet candidate located inside the Proxima Centauri habitable zone, Dr. Marois will discuss this remarkable discovery and the planet's potential to find life.

Header Image: The TVS roadside banner. Image Credit: Ross Gaunt

Calendar of Events (continued)

He will also present our current instrument project for the Gemini South observatory, TIKI, to discover similar planets around the two Sun-like pair located 15,000 AU from Proxima Centauri. The Alpha Centauri system is the prime target of the Breakthrough Starshot program, a project to send small quarter-size probes to take resolve images of these new worlds, and to prepare for Humanity's first step into a new star system.

Dr. Marois completed his Ph.D. at the Université de Montréal in 2004. The main topic of his thesis work was to understand the limits in exoplanet imaging and to design innovating observing strategies. After his thesis, he did postdoctoral researches at the Lawrence Livermore National Laboratory, Univ. of California Berkeley and NRC. In 2008, while at NRC, he led the team that took the first image of another planetary system (HR 8799) using the Keck and Gemini telescopes. He is currently pursuing his research at the NRC Herzberg where he is part of the Gemini Planet Imager campaign, and leading the development of instruments for imaging Earth-like planets at Gemini South and at the TMT.

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

March 15, 7:00pm

What: Is Anyone Out There Among the Stars: The Hundred-Million Dollar Breakthrough Listen Project
Who: Dr. Dan Wertheimer, UC Berkeley
Where: Smithwick Theatre, 12345 El Monte Road, Los Altos Hills, CA 94022
Cost: Free, $3 parking (Credit Cards or $1 dollar bills)

No details available.

For more information see: www.foothill.edu/news/newsfmt.php?sr=2&rec_id=5005 or phone 650-949-7888.

March 21, 12:00pm

What: NASA's Search for Habitable Planets and Life Beyond the Solar System
Who: Gary H. Blackwood, NASA JPL
Where: SETI Institute Colloquium, Microsoft Silicon Valley Campus (Galileo Room), 1065 La Avenida St., Mountain View, CA
Cost: Free

Dr. Gary H. Blackwood earned his BS, MS, and PhD in Aeronautical and Astronautical Engineering from MIT. He has been an employee at NASA's Jet Propulsion Laboratory in Pasadena, CA since 1988 and has worked on technology development for precision astronomical instruments and astrophysics missions including the Hubble Wide/Field Planetary Camera-2, the StarLight formation-flying interferometer, the Space Interferometry Mission and the Terrestrial Planet Finder. Since 2012 he has served as the Program Manager for the NASA Exoplanet Exploration Program, managed by JPL for the Astrophysics Division of the NASA Science Mission Directorate.

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

March 27, 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

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Calendar of Events (continued)

Campus (Galileo Room), 1065 La Avenida St., Mountain View, CA
Cost: Free

The all-sky TESS mission will soon revolutionize our view of planets transiting the nearest, brightest stars to the Sun, just as the four-year survey by NASA's Kepler mission transformed our understanding of exoplanet demographics. Using the repurposed Kepler spacecraft, the ongoing K2 mission provides a natural transition from Kepler to TESS in terms of sky coverage, survey duration, and intensity of ground-based follow-up observations. For the past three years I have led a large, multi-institutional team to discover, follow up, validate, and characterize hundreds of new candidates and planets using data from K2. I will highlight some of our key results from the first two years of K2 data, and will conclude with a discussion of the path forward to future exoplanet discovery and characterization.

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

April 3, 7:30pm

What: The Diversity of Alien Worlds
Who: Dr. Stephen Kane, San Francisco State University
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.

Over the past few decades, hundreds of new planetary systems have been discovered, many of which show remarkable diversity compared with our own Solar System. A key step towards characterizing these planets is the determination of which planets occupy the Habitable Zone (HZ) of their host stars. In this talk, Dr. Kane describes the properties of the HZ, the dependence on the stellar properties, and the current state of exoplanet detections in the HZ. Along the way, he will attempt to dispel some common misconceptions regarding the Habitable Zone. Finally, he will present several case studies of HZ Kepler planets, including new results from Kepler and the planet orbiting Proxima Centauri.

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

May 6, 11:00am - 4:00pm

What: Galaxy Explorers & Champions of Science Open House
Who: Chabot Exhibit
Where: Chabot Space and Science Center, 10000 Skyline Blvd., Oakland, CA 94619
Cost: Chabot Admission$18 Adults, $14 Youth, $15 Seniors, Free for Members

Our incredible Galaxy Explorer teen volunteers are learning and teaching science all year long. Join us for a showcase of this year's accomplishments from teen led science demonstrations to planetarium shows.

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

Journal Club By Ken Sperber

Iota Orionis Photometry Challenge

We've all seen it, Iota Orionins, the brightest star in the sword of Orion at 2.77mag. But, we probably didn't pay much attention to it, as we slewed our scopes to the Orion Nebula, one of the greatest objects to observe in the night sky.

Iota Orionis is a binary star, with the primary being Type O9 and the secondary being Type B1. The orbital period is about 29.1 days, and the orbit is highly eccentric (e = 0.764), with their closest approach distance being a factor of eight smaller than when they are farthest apart.

Pablo et al. (2017, Monthly Notices of the Royal Astronomical Society; www.alphagalileo.org/ViewItem.aspx?ItemId=173246&CultureCode=en) used photometry data from two BRITE-Constellation orbiting nano-satellites to characterize the brightness variations of Iota Orionis. They find Iota Orionis to be a heartbeat star, with a 1% peak-to-peak brightness change due to tidal distortions. It is called a heartbeat star since the largest brightness variation looks like the sinuous rhythm on an electrocardiogram. The heartbeat fluctuation, occurs over the course of a few days, once per orbit. When the two stars are close together, their mutual gravity distorts the shape of the stars, giving rise to the brightness variations. This is the first time that a heartbeat has been observed in such a massive star system (~35 solar masses), and the brightness variations are a factor of 10 larger than other heartbeat stars. The tidal interaction also excites higher frequency oscillations associated with starquakes, that allow the astronomers to probe the interior structure of the stars.

The Bright Target Explorer (BRITE)-Constellation consists of five nano-satellites whose mission is "to investigate stellar structure and evolution of the brightest stars in the sky and their interaction with the local environment. Micropulsation, wind phenomena, and other forms of stellar variability are recorded via high precision photometry in two colours (red and blue). The BRITE nanosatellites operate in low-Earth-orbits which allow for a superior time coverage and data length, not obtainable from ground" (www.brite-constellation.at/).

Since the heartbeat brightness variations are 1% peak-to-peak, and Iota Orionis is so bright, I believe the heartbeat

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TVS Outreach Photos

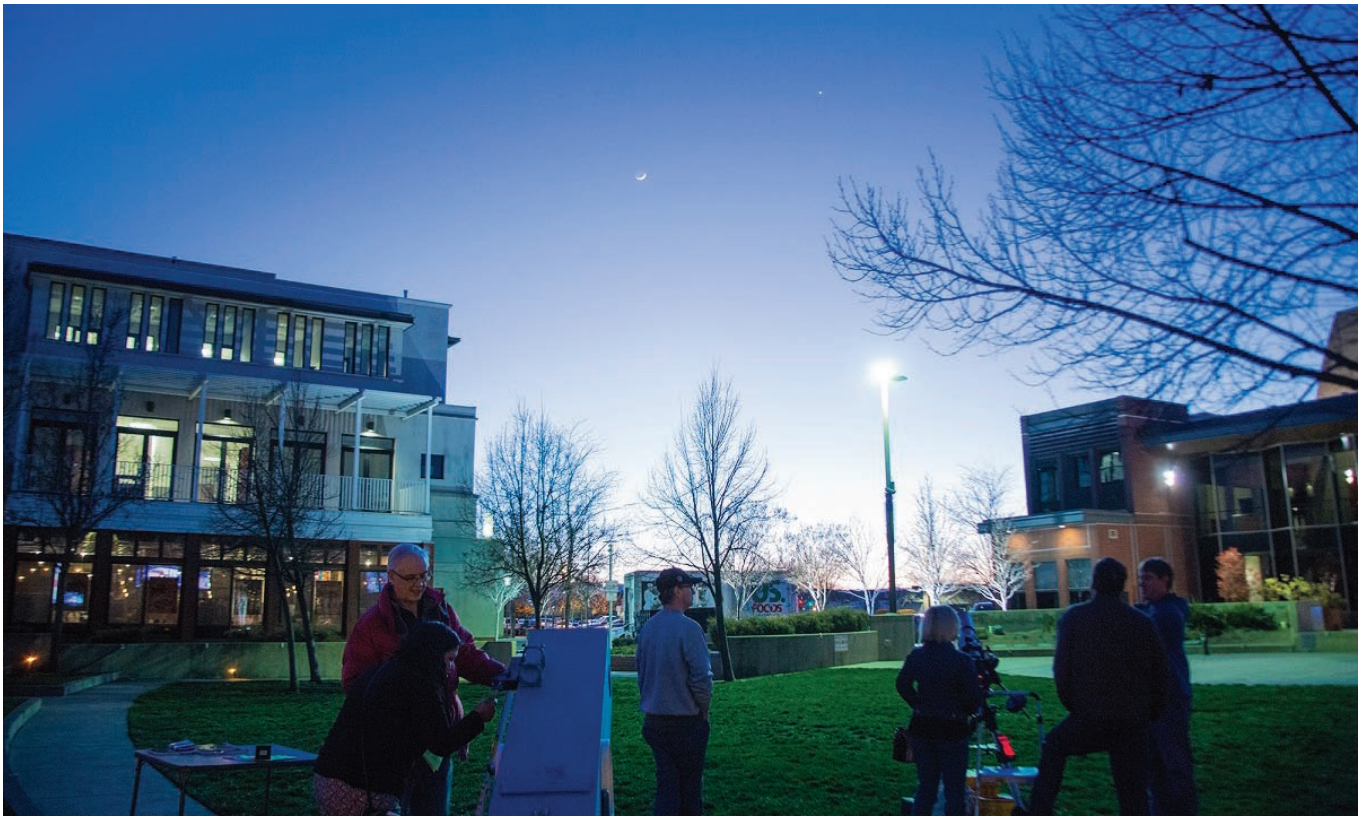

Image Caption: TVS members showing the crescents of Venus and the Moon to an interested public. TVS brought 4 telescopes to show off the duo. The gathering took place near the Bankhead Theater in Livermore on February 28. Image Credit: Ross Gaunt

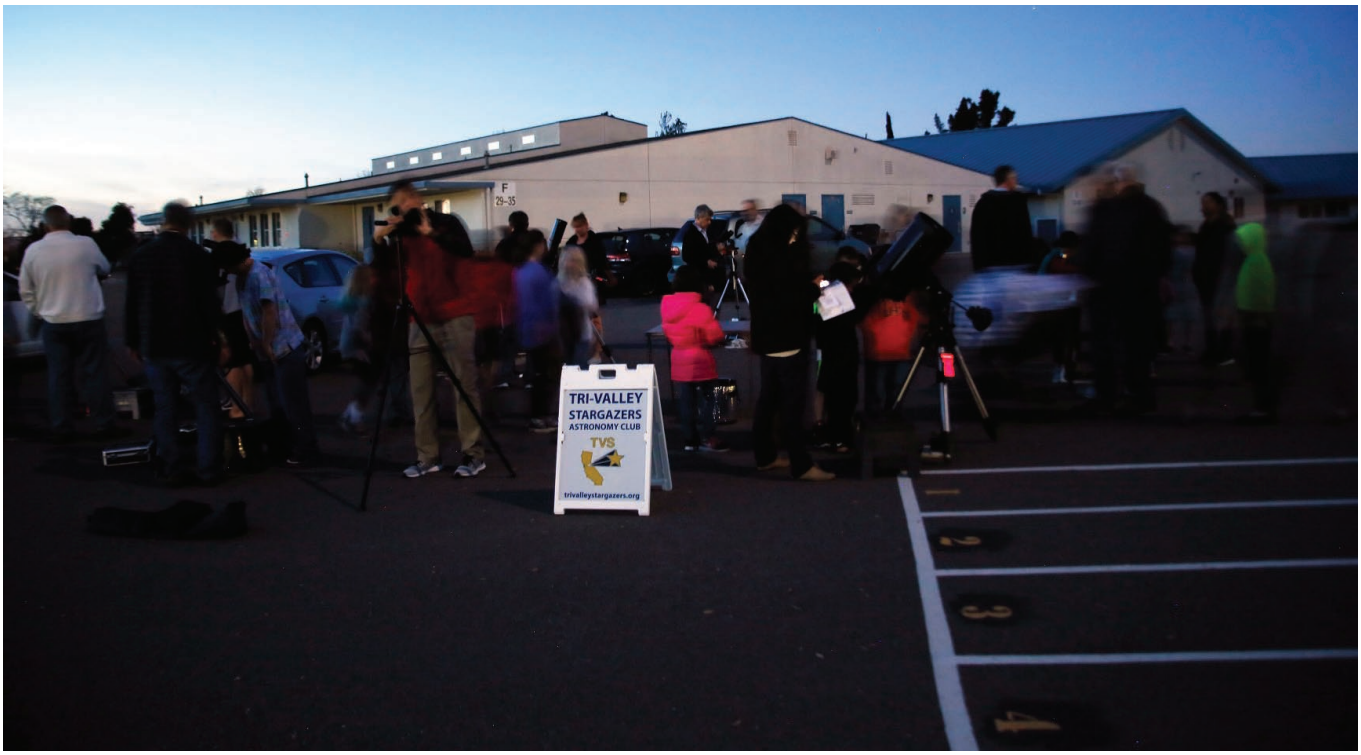

Image Caption: The March 8 outreach star party at Sunset Elementary School in Livermore kicks off as the sky darkens. TVS members brought 7 telescopes and high-power binoculars to show the participants some of the jewels of the night sky. Image Credit: Ross Gaunt

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

All times are Pacific Standard Time until Pacific Daylight Time begins on Sunday, March 12 at 2am.

March

12	Sun	Daylight Savings Time begins (2am)
12	Sun	Full Moon (7:54am)
14	Tue	Algol at minimum brightness for 2 hours centered at 9:24pm
20	Mon	Saturn about 3 degrees away from the last-quarter Moon
20	Mon	Last-Quarter Moon (8:58am)
27	Mon	New Moon (7:57pm)
28	Tue	Great opportunity to spot a 24-hour old crescent Moon using binoculars (west; 10-15 minutes after sunset)
29	Wed	Mars about 1.5 degrees above the thin crescent Moon (30-45 minutes after sunset)

April

1	Sat	Mercury reaches its highest altitude of the year (west; 30-45 minutes after sunset)
3	Mon	First-Quarter Moon (11:39am)
6	Thu	The Moon pairs with Regulus, the brightest star in Leo
7	Fri	Jupiter at opposition, visible all night
10	Mon	Full Moon located 2-5 degrees from Jupiter (11:08pm)
16	Sun	Saturn about 5 degrees below or lower-left of the Moon (highest 1 hour before sunrise)
18-	Tue-	Mars less than 4 degrees from the Pleiades for 5 nights (west; Evening)
19	Wed	Last-Quarter Moon (2:57am)
22	Sat	The weak Lyrid meteor shower peaks (predawn)
23	Sun	Crescent Moon 8 degrees to the right of Venus (east; Dawn)
26	Wed	New Moon (5:16am)
28	Fri	Mars about 1.5 degrees above the thin crescent Moon (30-45 minutes after sunset)

Journal Club (continued)

variations should be recordable with amateur equipment. For perspective, former TVS member Ron Bissinger was able to detect the transit of an exoplanet in front of HD 149026 that resulted in a 0.3% change in brightness. He did this from his backyard in Pleasanton using a Celestron 14-inch telescope and an SBIG ST-10XME CCD camera (www.skyandtelescope.com/astronomy-news/amateur-detects-new-transiting-exoplanet/). The real challenge for observing the heartbeat of Iota Orionis is performing high quality photometry over a long period of time, night after night for month after month, given the orbital period of 29.1 days. By obtaining multiple heartbeat events, one can average multitple events together to improve the signal-to-noise ratio. With Orion setting earlier and earlier in the evening this time of year, any attempt at a systematic program would probably have to wait until next year.

Solar Eclipse Provides Coronal Glimpse

By Marcus Woo

On August 21, 2017, North Americans will enjoy a rare treat: The first total solar eclipse visible from the continent since 1979. The sky will darken and the temperature will drop, in one of the most dramatic cosmic events on Earth. It could be a once-in-a-lifetime show indeed. But it will also be an opportunity to do some science.

Only during an eclipse, when the moon blocks the light from the sun's surface, does the sun's corona fully reveal itself. The corona is the hot and wispy atmosphere of the sun, extending far beyond the solar disk. But it's relatively dim, merely as bright as the full moon at night. The glaring sun, about a million times brighter, renders the corona invisible.

"The beauty of eclipse observations is that they are, at present, the only opportunity where one can observe the corona [in visible light] starting from the solar surface out to several solar radii," says Shadia Habbal, an astronomer at the University of Hawaii. To study the corona, she's traveled the world having experienced 14 total eclipses (she missed only five due to weather). This summer, she and her team will set up identical imaging systems and spectrometers at five locations along the path of totality, collecting data that's normally impossible to get.

Ground-based coronagraphs, instruments designed to study the corona by blocking the sun, can't view the full extent of the corona. Solar space-based telescopes don't have the spectrographs needed to measure how the temperatures vary throughout the corona. These temperature variations show how the sun's chemical composition is distributed—crucial information for solving one of long-standing mysteries about the corona: how it gets so hot.

While the sun's surface is ~9980 Farenheit (~5800 Kelvin), the corona can reach several millions of degrees Fahrenheit. Researchers have proposed many explanations involving magneto-acoustic waves and the dissipation of magnetic fields, but none can account for the wide-ranging temperature distribution in the corona, Habbal says.

You too can contribute to science through one of several citizen science projects. For example, you can also help study the corona through the Citizen CATE experiment; help produce a high definition, time-expanded video of the eclipse; use your ham radio to probe how an eclipse affects the propagation of radio waves in the ionosphere; or even observe how wildlife responds to such a unique event.

Otherwise, Habbal still encourages everyone to experience the eclipse. Never look directly at the sun, of course (find more safety guidelines here: https://eclipse2017.nasa.gov/safety). But during the approximately 2.5 minutes of totality, you may remove your safety glasses and watch the eclipse directly—only then can you see the glorious corona. So enjoy the show. The next one visible from North America won't be until 2024.

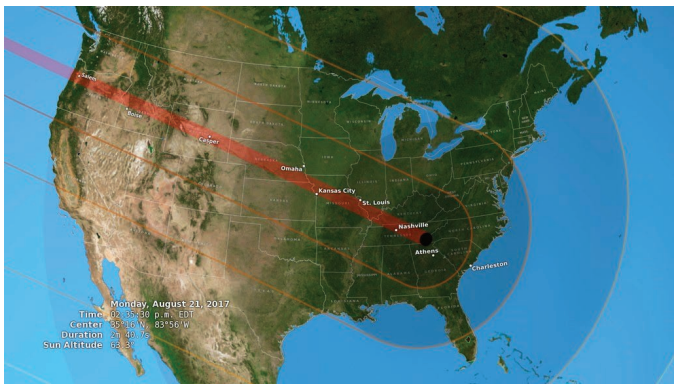

Image Caption: Illustration showing the United States during the total solar eclipse of August 21, 2017, with the umbra (black oval), penumbra (concentric shaded ovals), and path of totality (red) through or very near several major cities. Credit: Goddard Science Visualization Studio, NASA

For more information about the upcoming eclipse, please see:

NASA Eclipse citizen science page
https://eclipse2017.nasa.gov/citizen-science

NASA Eclipse safety guidelines
https://eclipse2017.nasa.gov/safety

Want to teach kids about eclipses? Go to the NASA Space Place and see our article on solar and lunar eclipses! http://spaceplace.nasa.gov/eclipses/

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 to explore space and Earth science!

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 ($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.