PRIMEFOCUS

Tri-Valley Stargazers

February 2019

Meeting Info

What: Fly Me to the Moon

Who: Bob Garfinkle, FRAS

When:
February 15, 2019
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

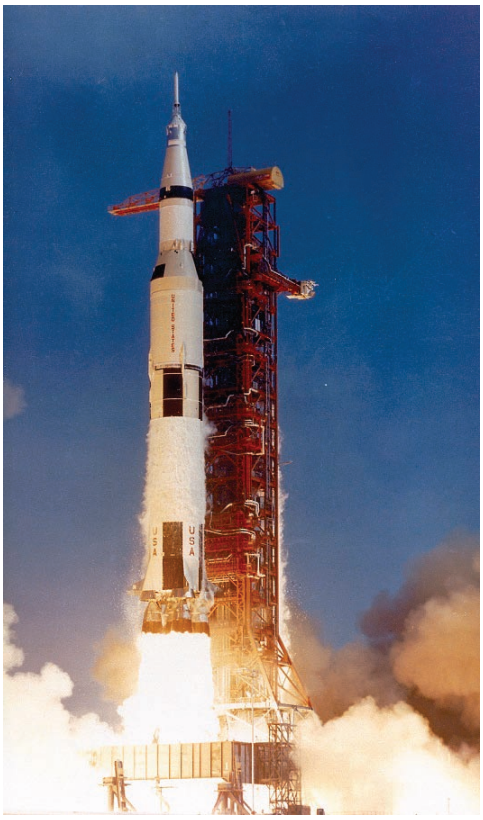
Inside

February Meeting

Fly Me to the Moon By Bob Garfinkle, FRAS

Bob writes astronomy books, articles, and book reviews and is recognized as an independent scholar on the history of astronomy and observing the night sky. His first book, *Star-Hopping: Your Visa to Viewing the Universe*, was published in 1994 by Cambridge University Press. This best-selling book was republished as both a hardback and paperback in 1997. He co-authored another best-selling book, *Advanced Skywatching*. This book has been translated into German and Spanish. Bob is finishing a major lunar observers' handbook to be published by Springer. In 1987, he was elected a Fellow of the Royal Astronomical Society of London. In May 2018, Bob was notified that the International Astronomical Union had renamed Minor Planet 2000 EY70 to be 31862 Garfinkle in his honor.

Bob received his first BA in History and a second BA in English Literature from Cal State-Hayward. He a Past President of the California Writers Club (2010-12). Bob is also the Membership Chair of the Niles Essanay Silent Film Museum.



Caption: the Saturn V launch vehicle (SA-506) for the Apollo 11 mission liftoff at 8:32 am CDT, July 16, 1969, from launch complex 39A at the Kennedy Space Center. Credit: NASA

TVS Program Director Update

Club President Roland Albers reports: After a year of finding outstanding speakers for our monthly club meetings, Lance Simms will be stepping down as our club's Program Director due to work demands. I'm sorry to see him go. Please join me in thanking Lance for his exceptional contributions to the club!

I am happy to announce that in March, Dan Helmer will be taking over as the new Program Direrctor. Many of you might be familiar with Dan, as he attends club meetings regularly, and he often observes at H2O. If you have any suggestions for a possible speaker for our meetings, please forward your recommendation and the associated contact information to him (programs"at"trivalleystargazers.org)

News & Notes

2019 TVS Meeting Dates

Below are the TVS meeting dates for 2019. 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**
Feb. 15	Feb. 18	
Mar. 15	Mar. 18	Feb. 22
Apr. 19	Apr. 22	Mar. 29
May 17	May 20	Apr. 26
Jun. 21	Jun. 24	May 31
Jul. 19	Jul. 22	Jun. 28
Aug. 16	Aug. 19	Jul. 26
Sep. 20	Sep. 23	Aug. 30
Oct. 18	Oct. 21	Sep. 27
Nov. 15	Nov. 18	Oct. 25
Dec. 20	Dec. 23	Nov. 29

Money Matters

As of the last Treasurer's Report on 1/21/19, our club's checking account balance is $19,571.45.

TVS Welcome to New Members

TVS would like to welcome new members Keith Wagstaff, Bill Parkhurst, Greg Douglas, and Keith Cloward. Please say hello and chat with them at upcoming club meetings.

Outreach Star Party

Thursday, February 28: Livermore School District Science Odyssey (5-7pm) at the Junction Ave. K-8. Students in grades 1-12 will participate. TVS will have a booth with astronomy related activities that TVS members can help with. We will set up telescopes outdoors, and after it gets dark we will do some observing. Contact Eric Dueltgen if you are interested in participating (outreach"at"trivalleystargazers.org).

CalStar Events and Golden State Star Party Registration

CalStar Star Parties will be held on April 3-7 and September 25-28. The location is only 3 hours away at Lake San Antonio in southern Monterey County. CalStar is a loosely organized party with no registration and no structure held at the County park. Just show up and pay the camping fee and join the group of about 100 star gazers in a section of the park reserved for us. For more information see: https://calstar.observers.org/

The Golden Star Star Party will be held over four nights on June 29-July 2 (departure (July 3) near Aiden, CA. Early Registration online is $60 through March 30, $70 thereafter, or $75 onsite. If you do not plan on spending 4 nights, registration is $25/night. For additional fees you can feast at the BBQ's on Sunday and Monday nights, and there is a free pancake breakfast on July 2. Attendance is typically 300-400 people. For more informations see: http://goldenstatestarparty.org/ and TVS member Curtis Macchioni's presentation on GSSP can be found at: http://www.trivalleystargazers.org/pdfs/GSSP.pdf

Calendar of Events

February 11, 7:30pm

What: New Approaches to Looking for E.T.
Who: Dr. Seth Shostak, SETI Institute
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.

For six decades, a tiny group of scientists has probed the cosmos for evidence of aliens. Is this an endless quest, or could we soon learn of other beings in the nearby universe? We'll discuss the latest efforts to uncover the extraterrestrials, as well as some disturbing ideas that could change the way we hunt for cosmic company. Also, what happens if we do detect someone or something out there? Would that radically change our own society, or merely be an interesting story for a week or two?

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

February 13, 7:00pm - 8:00pm

What: The Future of NASA Space Telescopes – What to Look for in the Next Generation
Who: Prof. Courtney Dressing, Dr. Kimberly Ennico Smith, and Prof. Scott Gaudi
Where: SRI Conference Center, 333 Ravenswood Ave., Menlo Park, CA 94205 (Enter from Middlefield Rd.)
Cost: Free

What should we expect from the next generation of space telescopes? What key scientific questions will they help answer? Do we have the technology we need to operate them in 20-30 years?

To address these issues, NASA selected four large space mission concepts to study and consider as possible future Large Strategic Science Missions. Three of those space telescopes got the attention of the SETI Institute because of their potential to answer the question, "Are We Alone?"

The Origins Space Telescope (Origins) could help scientists understand the abundance and availability of water for habitable planets and could look for biosignatures on potentially habitable worlds transiting low-mass stars.

Header Image: One of the most famous photographs of the Apollo era, the Earth appearing to rise above the Moon's limb, taken by the Apollo 8 crew on Dec. 24, 1968. Credit: NASA

Calendar of Events (continued)

The Large UV Optical Infrared Surveyor (or LUVOIR) is a general-purpose observatory; its key science goal is to characterize a wide range of exoplanets, including those that might be habitable and orbiting a range of stellar types.

The Habitable Exoplanet Imaging Mission (HabEx) is a space telescope, optimized to search for and image Earth-sized exoplanets in the habitable zones around sun-like stars, where liquid water might exist.

These mission concepts, to be described in detail, will be delivered to the National Academy of Sciences for the Astro 2020 Decadal Survey. It is still unknown whether the Decadal Survey will prioritize any of these concepts, but the science they can deliver will be compelling and change our view of the cosmos, just as the Hubble Space Telescope has done for the past 3 decades.

During this SETI Talk, three scientists directly involved in each one of the three teams above to discuss these exciting future missions.

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

February 19, 7:30pm-10:00pm

What: San Jose Astronomical Association SIG Meeting
Who: Glenn N.
Where: 3972 Twilight Dr, San Jose, CA, 95124
Cost: Free

The Imaging SIG meets roughly every month at Houge 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/257902472/.

February 27, 7:00pm

What: The Worlds Under Our Feet: Caves from Earth to Mars and Beyond
Who: Dr. Penelope Boston, NASA Ames Research Center
Where: Smithwick Theatre, 12345 El Monte Road, Los Altos Hills, CA 94022
Cost: Free, $3 parking (Credit Cards or $1 dollar bills)

New exploration indicates that caves may be more common on rocky and icy worlds in our Solar System than we have thought in the past. Caves below the Earth show us a very different planet than the familiar one we experience on the surface. Each dark cave system has its own micro-organisms and distinctive mineral and chemical properties. So we infer that caves on Mars and on some of the icy moons of the outer planets will also have characteristics quite different from their surfaces. We will take a tour of the some of the most spectacular caves under the Earth and the unusual life-forms they harbor, and consider how the lessons they teach us can be applied to the exploration of the Solar System.

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

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

What: $5 First Friday: Women in STEAM
Who: Family Night
Where: Chabot Space and Science Center, 10000 Skyline Blvd., Oakland, CA 94619
Cost: $5

continued on p.4

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info@trivalleystargazers.org

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 (continued)

March is Women's History Month and women have a long history of contributing to science and discovery! Join Chabot in celebrating past, present, and future women in STEAM fields (Science, Technology, Engineering, Art, and Mathematics).

For more information see: https://chabotspace.org/events/events-listing/ or for more information, call (510) 336-7373

March 4, 7:30pm

What: OSIRIS-REx: NASA's First Asteroid Sample Return Mission

Who: Daniella DellaGiustina, Image Processing Lead, OSIRIS-REx

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.

NASA's OSIRIS-REx mission is the first U.S. mission to retrieve a pristine sample of an asteroid and return it to Earth for further study. The mission's target is Bennu, a carbon-rich near-Earth asteroid that is also potentially hazardous to Earth. Studying Bennu will revolutionize our understanding of the early Solar System and teach us much about planetary history and the origin of life. The OSIRIS-REx mission will expand our knowledge of the hazards and resources in near-Earth space and will serve as a precursor to future asteroid missions. The window for sample acquisition opens on July 4, 2020. The sample will return to Earth on September 24, 2023.

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

Mirror Testing By Gert Gottschalk

President Roland and board members Rich and Gert performed optical testing on two 18-inch mirrors originating from donations to the club. TVS received generous donations by two fellow amateur astronomers of 18-inch Dobsonian telescopes. We wanted to assess the optical quality of both mirrors and determine options to use one of them for Rich's light weight OTA (optical tube assembly) rebuild of the Jack Marling Telescope at the TVS dark sky observing site.

The testing was set up in a nice long corridor at Roland's house. The hard wood floor turned out to be surprisingly stable and did not flex and distort the optical measurements. To prevent air currents from interfering, the AC vent had to be turned off.

Using Gert's knife edge tester with micrometer dial, we performed a pin stick zone test. In this test a wooden ruler with nails at particular radius zones of the mirror is taped to the mirror. The shadow and light border seen in the tester when

Image Caption: Testing the figures of the candidate mirrors for upgrading the Marling Telescope.

light from a slit source is bounced off the mirror and partially blocked by the knife edge gives a reading of that zone's focal point. The FigureXP program can then compute the shape of the mirror with respect to the ideal parabolic curve.

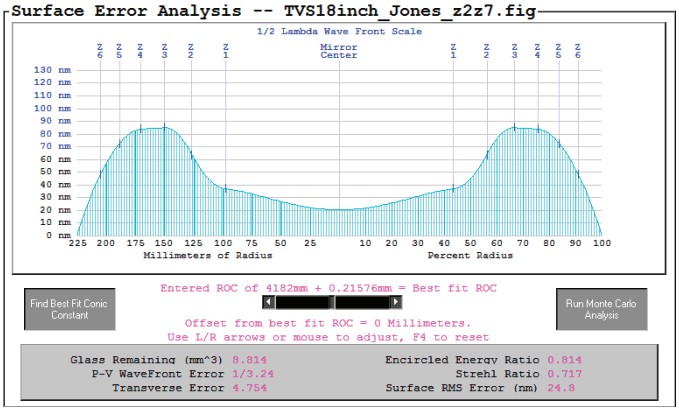


Image Caption: Mirror surface cross section. Note that the center will be covered by the obstruction of the secondary mirror.

Judging where the shadow border hits the pins is tricky business and the group took turns measuring data sets of both mirrors. In the end measurements were averaged and checked against outliers. The results in FigureXP software show that the mirror from the 'Jones scope' has the better figure, being between 1/3 to 1/4 Lambda wavefront error vs. a perfect parabola. The 'McIntire scope' mirror came in a bit

continued on p.6

Club Lunar Eclipse Photos

Image Caption: Images of the January 20, 2019 total lunar eclipse. Top row: Alan Gorski photographed the full Moon during the penumbral stage and during totality. Haze and fast moving thin cloud forced him to use ISO25600 for fast exposures. Middle row: Ron Kane took this image from Livermore, nicely showing the Super Blood Wolf Moon near the end of totality and in the context of background stars. Bottom row: Gert Gottschalk and Sibylle Frohlich imaged the Moon through sucker-holes from Fremont. These images were taken at nearly the same time, using different exposures to emphasize features on the illuminated portion of the Moon and the shadowed portion, respectively. See their website for more images and information: http://skywatcher.space:8000/mofi_190121/mofi_190121.htm

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

All times are Pacific Standard Time until March 10, then PDT

February

12	Tue	First-Quarter Moon (5:26pm)
13	Wed	The Moon is in the Hyades, 2° from Aldebaran (Evening)
17	Sun	The Moon is adjacent to M44, the Beehive Cluster (Evening)
17-19	Sun-	Venus passes over Saturn, separated by ~1° on the morning of the 18th (Morning)
19	Tue	Full Moon (5:54am)
21-	Thu-	Zodiacal light visible in the west after sunset, stretching from Taurus to Gemini (Evening)
23	Sat	Algol at minimum brightness for 2 hours centered on 10:41pm PST
26	Tue	Last-Quarter Moon (4:28am)
27-28	Wed-	Antares, Jupiter, the Moon, Saturn, and Venus form an arc in the east-southeast (Dawn)

March

1-3	Fri-	Venus, Saturn, Jupiter, and the crescent Moon form an arc in the southeast (Dawn)
6	Wed	New Moon (8:04am)
10	Sun	Daylight Savings Time begins at 2:00am
11	Mon	The crescent Moon and Mars are 7° apart, setting together at about midnight
12	Tue	The Moon is close to the Hyades (Evening)
14	Thu	First-Quarter Moon (3:27am)
18-19	Mon	The Moon and Regulus are 2° apart at dusk, with the distance increasing to 5.5° near dawn
18	Mon	Algol at minimum brightness for 2 hours centered on 10:15pm PDT
20	Wed	Spring begins at 2:58pm PDT
20	Wed	Full Moon (6:43pm)
21-	Thu-	Zodiacal light visible in the west after sunset for the next 2 weeks (Evening)
21	Thu	Algol at minimum brightness for 2 hours centered on 7:04pm PDT
26-29	Tue-	Over 4 nights the Moon traverses the domain from Jupiter to Saturn (Morning)
27	Wed	Last-Quarter Moon (9:10pm)

Mirror Testing (con't)

worse.

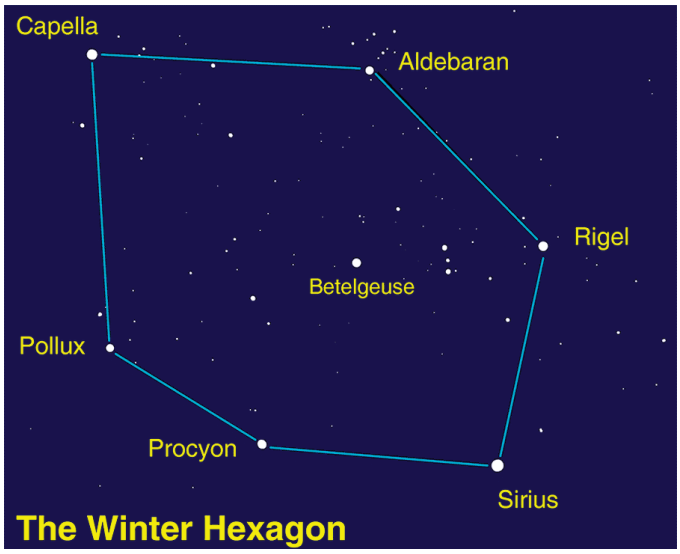
The elevated ring zone, seen at about 70% radius in the Surface Error Analysis, will have to be checked again. As mentioned earlier the shadow readings are often depending on physiological interpretations (where is the shadow exactly half brightness?) We plan to first clean the mirror which was pretty dusty and then try a measurement series on Gert's interferometer setup. This will give a second data point for the mirror quality. If the mirror performs as indicated in the first test it will be a great asset for the new OTA of the Jack Marling Telescope at the TVS site.

NASA Night Sky Notes

Hexagon at Night, Quartet in the Morning

By David Prosper

The stars that make up the Winter Hexagon asterism are some of the brightest in the night sky and February evenings are a great time to enjoy their sparkly splendor. The Winter Hexagon is so large in size that the six stars that make up its points are also the brightest members of six different constellations, making the Hexagon a great starting point for learning the winter sky. Find the Hexagon by looking southeast after sunset and finding the bright red star that forms the "left shoulder" of the constellation Orion: Betelgeuse. You can think of Betelgeuse as the center of a large irregular clock, with the Winter Hexagon stars as the clock's hour numbers. Move diagonally across Orion to spot its "right foot," the bright star Rigel. Now move clockwise from Rigel to the brightest star in the night sky: Sirius in Canis Major. Continue ticking along clockwise to Procyon in Canis Minor and then towards Pollux, the brighter of the Gemini twins. Keep moving around the circuit to find Capella in Auriga, and finish at orange Aldebaran, the "eye" of the V-shaped face of Taurus the Bull.



Caption: The stars of the Winter Hexagon. Image created with help from Stellarium

Two naked-eye planets are visible in the evening sky this month. As red Mars moves across Pisces, NASA's InSight Mission is readying its suite of geological instruments designed to study the Martian interior. InSight and the rest of humanity's robotic Martian emissaries will soon be joined by the Mars 2020 rover. The SUV-sized robot is slated to launch next year on a mission to study the possibility of past life on the red planet. A conjunction between Mars and Uranus on February 13 will be a treat for telescopic observers. Mars will pass a little over a degree away from Uranus and larger magnifications will allow comparisons between the small red disc of dusty Mars with the smaller and much more distant blue-green disc of ice giant Uranus.

Speedy Mercury has a good showing this month and makes its highest appearance in the evening on February 27; spot it above the western horizon at sunset. An unobstructed western view and binoculars will greatly help in catching Mercury against the glow of evening twilight.

The morning planets put on quite a show in February. Look for the bright planets Venus, Jupiter, and Saturn above the eastern horizon all month, at times forming a neat lineup. A crescent Moon makes a stunning addition on the mornings of February 1-2, and again on the 28th. Watch over the course of the month as Venus travels from its position above Jupiter to below dimmer Saturn. Venus and Saturn will be in close conjunction on the 18th; see if you can fit both planets into the same telescopic field of view. A telescope reveals the brilliant thin crescent phase of Venus waxing into a wide gibbous phase as the planet passes around the other side of our Sun. The Night Sky Network has a simple activity that helps explain the nature of both Venus and Mercury's phases at bit.ly/venusphases

You can catch up on all of NASA's current and future missions at nasa.gov

This article is distributed by the NASA Night Sky Network, a coalition of hundreds of astronomy clubs across the US dedicated to astronomy outreach. Visit nightsky.jpl.nasa.gov to find local clubs, events, stargazing info and more.

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.