

PRIMEFOCUS

Tri-Valley Stargazers



July 2020



Meeting Info: Observing Atmospheric Gravity Waves and High- Altitude Turbulence

Who:
Dr. Matthew Horsley

When:
July 17, 2020
Meeting at 7:30 p.m.
Lecture at 8:00 p.m.

Where:
Virtual Meeting using: Zoom*
See the April or May issue of
PrimeFocus for info on getting
connected using Zoom.

Inside

News & Notes	2
Calendar of Events	2
TVS Astrophotos	4-5
What's Up	6
NASA Night Sky Notes	7
Membership/Renewal Application	8

July Virtual Meeting Using "Zoom"

Nanosat-based Stellar Occultation: Developing Inexpensive Methods to Observe Atmospheric Gravity Waves and High-Altitude Turbulence

Dr. Matthew Horsley, Lawrence Livermore National Laboratory

Our project is developing instrumentation to remotely sense properties of atmospheric gravity waves. Gravity waves are atmospheric disturbances that can propagate from the troposphere all the way to the thermosphere. As the wave propagates upwards, air parcels along the path are displaced, creating perturbations in the local density and temperature. However, the density and temperature perturbations created by a passing gravity wave are small and occur at high altitudes, making them difficult to observe. Based on the limited observational capabilities currently available, it is strongly suspected that energy inputs into the stratosphere are largely driven by atmospheric gravity waves. These energy and momentum inputs influence the dynamics of the upper atmosphere, potentially affect aerosol distributions and in cases where the gravity wave breaks in the stratosphere can lead to turbulence.

Our observational methods are based on stellar occultation (observing a star as the line of sight transits through the Earth's atmosphere). This technique has been used in the past and was shown to be capable of detecting and characterizing gravity waves. However, these past experiments were hosted on conventional satellites which come with astronomical costs. This high cost forces the atmospheric research community to prioritize satellite missions, selecting only the top 1 or 2 missions to fund. The result is that many important science needs go unmet. Small satellites offer the potential to fill this gap, providing a platform to host sensors capable of collecting this much needed data at a greatly reduced cost.

In this talk I will introduce atmospheric gravity waves and discuss the basic physics of stellar occultation. After this, I will talk about how we developed instrumentation to perform stellar occultation that is small enough, light enough and robust enough to be hosted on a Low Earth Orbit nanosat. Simulated results will be shared as well as some preliminary data collected on orbit.

Bio: Dr. Matthew Horsley is a Physicist in the Physical and Life Sciences Directorate at Lawrence Livermore National Laboratory. He received his Ph.D. in physics from Yale University in 2002. His primary research interests are nanosatellite-based sensing schemes, control and re-entry physics as well as RF and Quantum technologies. He is currently the Principal Investigator for a nanosatellite remote atmospheric sensing project which is designed to detect and characterize atmospheric gravity waves propagating from the ground level up to altitudes as high as 70-80 km

News & Notes

2020 TVS Meeting Dates

Below are the TVS meeting dates for 2020. 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
Jul. 17	Jul. 20	
Aug. 21	Aug. 24	Aug. 07
Sep. 18	Sep. 21	Sep. 04
Oct. 16	Oct. 19	Oct. 02
Nov. 20	Nov. 23	Nov. 06
Dec. 18	Dec. 21	Dec. 04

Money Matters

As of the last Treasurer's Report on 06/22/20, our club's account balance is \$12,955.59.

TVS Welcome to New Members

TVS would like to welcome new members Teresa Busey, Julio Kovacs, Roger Perry, and Arnold Schmidt. Please say hello and chat with them during our Zoom club meetings.

H2O and Del Valle Observing Sites Reopened

TVS maintains two observing sites: our Del Valle site on EBRPD property and Hidden Hill Observatory on private property. The club is happy to announce that both sites reopened for observing on June 1st. However, due to the ongoing COVID-19 emergency, the following additional restrictions must be followed:

*The sites are open for individual use only by club members and immediate family; no guests or group events allowed

*You use each observing site at your own risk and agree to hold the club and the landowners free of all liability

*Do not use either observing site if you are not feeling well or suspect you were recently exposed to the virus

*Announce your intention to use either site on our groups.io group

*While at either site maintain social distancing of at least 15 feet (about a car's length)

*Bring hand sanitizer and use it before and after touching any locks or facilities

*Club members should not touch or look through each other's equipment. Focuser knobs and eyepieces can potentially spread the virus.

*H2O keyholders who wish to use the Quick Dome should first contact Ross Gaunt (secretary@trivalleystargazers.org) to reserve it for individual use for the day

*H2O patrons who wish to use the Marling Scope should

first contact Chuck Grant (observatory@trivalleystargazers.org) to reserve it for individual use for the day

*Note that these restrictions do not replace or negate any Alameda or Santa Clara County health orders in place at this time.

Ross Gaunt, our club secretary, emailed the updated lock combinations and usage instructions for each site to all H2O keyholders and all Del Valle registered users. If you are an H2O keyholder or Del Valle registered user and didn't get Ross's email, please let Roland (president@trivalleystargazers.org) or Ross know and we'll straighten it out. Stay safe and happy observing!

TVS Star Party Descriptions

NOTE: ALL STAR PARTIES ARE SUBJECT TO POSSIBLE CANCELLATION PENDING THE STATUS OF STATE AND COUNTY COVID-19 RESTRICTIONS.

Del Valle star parties are also public outreach events. They are jointly hosted with the EBRPD and held at the Arroyo Staging Area. The public is invited for the first 1.5-2 hours, while club members can stay the remainder of the night.

Tesla Vintners star parties are open to only club members and their guests. These star parties end at midnight, but participants can leave earlier, should they wish.

H2O star parties are open to the public. The open house ends at midnight, and all participants are encouraged to stay the duration. The drive to H2O takes about 1 hour, and the caravan leaves promptly from the corner of Mines and Tesla Rds.

Outreach Star Party Schedule

August 22: Bankhead Theater

Contact Eric Dueltgen if you are interested in participating (outreach@trivalleystargazers.org).

2020 Club Star Party Schedule

August 15: H2O

September 12: Tesla Vintners

September 19: Del Valle Arroyo

October 17: Tesla Vintners

Calendar of Events

July 22, 7:00pm

What: Astronomy in Space: From Hubble to Roman

Who: Prof. Meg Urry (Yale) and Dr. John Grunsfeld

Sponsor: SETI Institute

Online: <https://www.seti.org/event/astronomy-space-hubble-roman>; REGISTRATION REQUIRED

Header Image: Atmospheric Gravity Waves. Image Credit: NASA/GSFC/MODIS Land Rapid Response Team and Jeff Schmaltz

Calendar of Events (continued)

Thirty years ago, the U.S. launched the famous Hubble Space Telescope, whose unique design allowed astronauts to repair and upgrade it in space using advanced technology. It is one of the NASA's longest-living and most valuable space-based observatories, beaming transformational astronomical images to Earth for decades. Hubble has fundamentally changed our understanding of the cosmos, and its story — filled with challenges overcome by innovation, determination, and the human spirit — inspires us.

The newly named Nancy Grace Roman Space Telescope – or Roman Space Telescope, (formerly known as WFIRST) – is set to launch in the mid-2020s. It will investigate long-standing astronomical mysteries, such as the force behind the universe's expansion and search for distant planets beyond our solar system.

July 24, 8:00pm

What: Mars Madness
Who: Benjamin Burrell (Chabot)
Sponsor: Chabot Space and Science Center
Online: <https://chabotspace.org/events/events-listing/>

Join us on Facebook Live for a night of Mars-themed activities and talks. Learn about the destination of the Mars 2020 Perseverance Rover, which is soon heading to Mars to seek signs of ancient life and collect rock and soil samples.

See Chabot images of Mars, make your own Mars rover, toast with "Mars Rock" Bombs, enjoy Mars trivia and Q&A with Chabot astronomers.

To receive a notification when the talk begins, make sure to "Like" the Chabot Space and Science Center Facebook page.

If you miss the live event, the full presentation will be released on the YouTube channel within one week of the event: https://www.youtube.com/channel/UCarFXs-04xmdHW_PVc7LWRg

July 25, 7:30pm

What: Galactic Weather
Who: Yong Zheng, UC Berkeley
Where: Mt. Tamalpais State Park, Cushing Memorial Amphitheater, more commonly known as the Mountain Theater, Rock Spring parking area
Cost: Free

Just as Earth has an atmosphere, and stars (like the Sun) have coronas, galaxies are embedded in invisible halos of atomic gases. As galaxies evolve, these gaseous halos exhibit many interesting phenomena similar to rains and droughts on Earth. What do these enormous galactic climate systems look like, how are they studied, and how do they behave.

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

July 28, 7:15pm

What: Back to the Moon
Who: Director Gregory Schmidt, NASA
Where: Mt. Diablo Astronomical Society, Lindsay Wildlife Experience, Community Room, 1931 First St., Walnut Creek, CA 94597
Cost: Free

Details not available.

For more information see: https://nightsky.jpl.nasa.gov/event-view.cfm?Event_ID=106411

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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.

TVS Astrophotos: Comet NEOWISE (C/2020 F3)



Image Captions: Kai Yung took the upper and lower-left images of Comet NEOWISE. The upper image was taken with a modified Canon 6D, 135mm lens, f/2, ISO-400, 1 sec exposure. His bottom-left image was taken with an ASI294mv Pro camera attached to a Canon 300mm lens at f/4. The best 100 frames were used. Lower-right: Ken Sperber composited 4 images of Comet NEOWISE rising, with each image separated by 4 minutes. He used a Canon 6D, 135mm lens, f/2.8, ISO-1250, 2 sec exposure.

TVS Astrophotos: The Veil Nebula

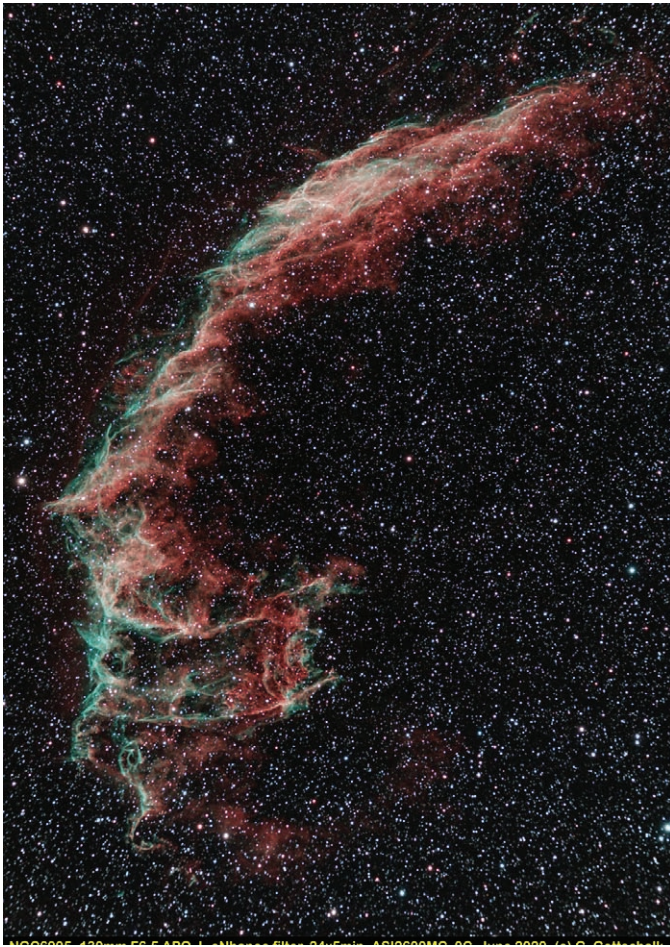


Image Caption: Gert Gottschalk imaged NGC6995, the Eastern Veil Nebula. This nebula, in the constellation Cygnus, is the remnant of an ancient supernova explosion. The wikipedia article gives an estimated explosion date of 10,000 to 20,000 years ago when a star with 20 solar masses exploded as a supernova. Based on direct astrometric measurements, 2400 light years is now the accepted distance to the Veil Nebula. Together with the Western Veil Nebula, NGC6960 and other nebulosity, these objects form the Cygnus Loop. The nebula is made of Hydrogen gas mixed with ionized Oxygen. The emission lines give the nebula it's characteristic colors of red (Hydrogen) and blue-green (Oxygen). The image was taken at the TVS dark sky observing site using a 130mm F6.5 refracting telescope with a 26 Megapixel color CMOS camera. 24 individual exposures of 5min. each (total of 2hrs) were combined in PixInsight image processing software for the final image, which can be found at: http://www.trivalleystargazers.org/gert/CCD_Gallery/ngc6995_asi2600.html. Gert's corresponding image of the Western Veil Nebula can be found at: http://www.trivalleystargazers.org/gert/CCD_Gallery/ngc6960_asi2600.html.

(source : https://en.wikipedia.org/wiki/Veil_Nebula)

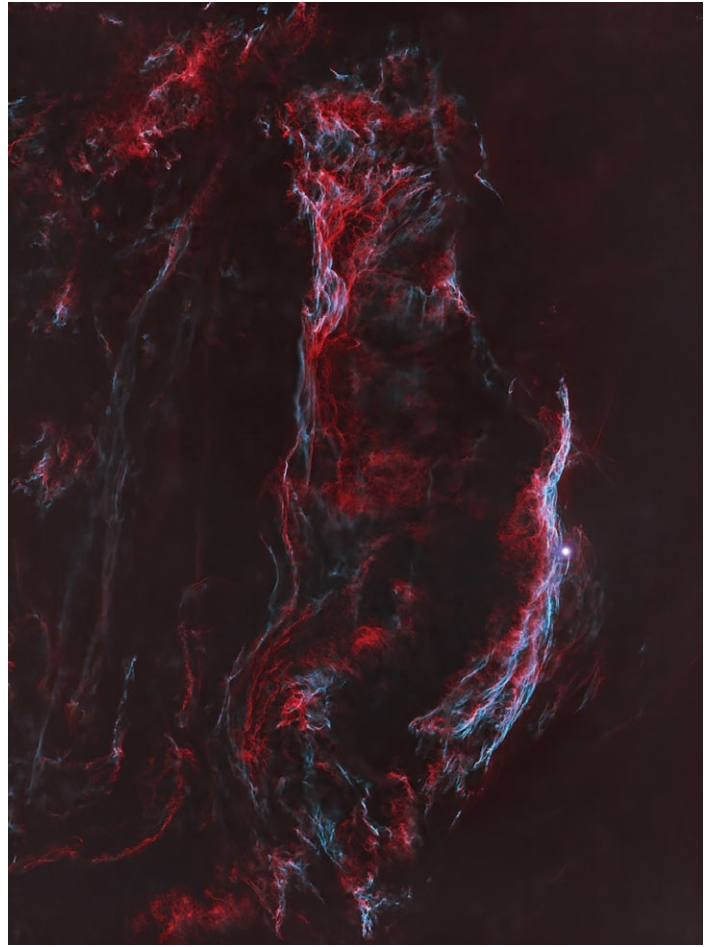


Image Caption: Mohamed Yassine imaged NGC6960, the Western Veil Nebula, Pickering's Triangular Wisp, and NGC6979. This is a nearly 25-hour exposure consisting of RGB (60 x 60sec, each), and H-alpha and OIII (130 x 300sec, each). The image was taken from Moe's driveway using a William Optics GT81 APO with the William Optics Focal Reducer 6AIII using a ZWO ASI1600mm-Pro camera. Moe used a special technique to remove stars from the final image (excepting 52 Cygni). This image can be found at: <https://www.astrobin.com/thv3wf/?nc=user> and the image with stars is located at: <https://www.astrobin.com/full/ezohtq/B/?nc=user>.

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

All times are Pacific Daylight Time

July

- 14 Tue Jupiter at opposition (Visible all night)
- 17 Fri The Moon, Venus, and Aldebaran form an arc $\sim 6^\circ$ long (Dawn)
- 20 Mon New Moon (10:33am)**
- 20 Mon Saturn at opposition (Visible all night)
- 22 Wed The crescent Moon is $\sim 3^\circ$ from Regulus, low in the west (Dusk)
- 27 Mon First-Quarter Moon (5:33am)**
- 28- Tue- The Delta Aquariid meteor shower peaks with best viewing before dawn on Wednesday morning
- 29 Wed The crescent Moon is $\sim 5^\circ$ from Antares (Dusk)
- 31 Fri The Moon, Jupiter, and Saturn form a line $\sim 20^\circ$ long in the southeast (Dusk)

August

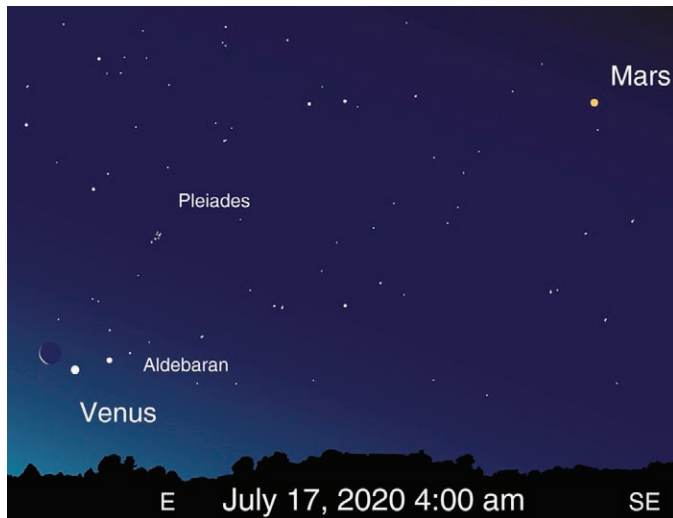
- 1 Sat Jupiter, Saturn, and the Moon form a triangle in the southeast (Dusk)
- 3 Mon Full Moon (8:59am)**
- 9 Sun Mars and the Moon are $\sim 1^\circ$ apart (Morning)
- 11 Tue Last-Quarter Moon (9:45am)**
- 11 Tue The Perseid Meteor shower peaks on the night-morning of the 11-12 (Visible all night)
- 13 Thu The Moon and Aldebaran are $\sim 4^\circ$ apart (Morning)
- 15 Sat The Moon and Venus are $\sim 3^\circ$ apart in Gemini (Dawn)
- 18 Tue New Moon (7:42pm)**
- 22 Sat The crescent Moon is $\sim 5^\circ$ from Spica (Dusk)
- 25 Tue First-Quarter Moon (10:58am)**
- 25 Tue The Moon is $\sim 5^\circ$ from Antares (Dusk)
- 27 Thu Saturn, Jupiter and the Moon form a line (Dusk)
- 28 Fri The Moon is $\sim 2^\circ$ from Jupiter with Saturn to the left (Dusk)
- 29 Sat The Moon, Saturn, and Jupiter form a line (Dusk)

NASA Night Sky Notes

Mars's Latest Visitor: NASA's Perseverance Rover

By David Prosper

NASA's latest Mars rover, Perseverance, is launching later this month! This amazing robot explorer will scout the surface of Mars for possible signs of ancient life and collect soil samples for return to Earth by future missions. It will even carry the first off-planet helicopter: Ingenuity. Not coincidentally, Perseverance will be on its way to the red planet just as Mars dramatically increases in brightness and visibility to eager stargazers as our planets race towards their closest approach in October of this year.



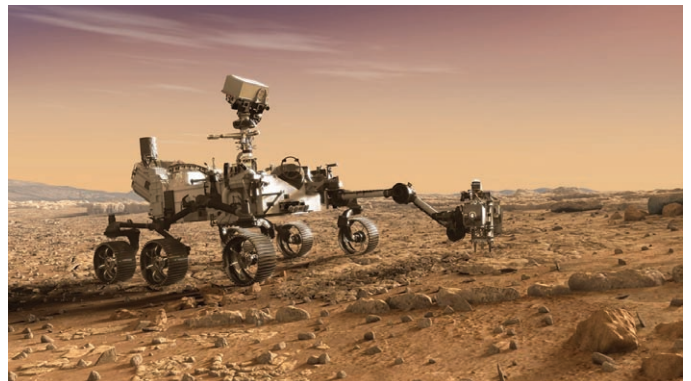
Caption: Observe Mars yourself over the next few months! Mars can be found in early morning skies throughout July, and by the end of the month will rise before midnight. Mars gradually brightens every night until the close approach of Mars in October. The pre-dawn skies of July 17 present an especially nice view, as the waning crescent Moon will appear near Venus and Aldebaran.

Perseverance's engineers built upon the success of its engineering cousin, Curiosity, and its design features many unique upgrades for a new science mission! In February of 2021, Perseverance will land at the site of an ancient river delta inside of Jezero Crater and ready its suite of seven primary scientific instruments. The rover will search for traces of past life, including possible Martian fossils, with WATSON and SHERLOC, two advanced cameras capable of seeing tiny details. The rover also carries an amazing instrument, SuperCam, to blast rocks and soil outside of the rover's reach with lasers to determine their chemical makeup with its onboard suite of cameras and spectrometers. Perseverance will also take core samples of some of the most promising

rocks and soil, storing them for later study with its unique caching system. Future missions will retrieve these samples from the rover and return them for detailed study by scientists on Earth. Perseverance also carries two microphones so we can hear the sounds of Mars and the noises of its instruments at work. It will even launch a small helicopter - Ingenuity - into the Martian atmosphere as a trial for future aerial exploration!

Would you like to contribute to Mars mission science? You can help NASA's rover drivers safely navigate the Martian surface by contributing to the AI4Mars project! Use this tool to label terrain features on photos taken of the Martian surface by NASA missions to help train an artificial intelligence algorithm to better read their surrounding landscape: bit.ly/AI4Mars

The launch of Mars Perseverance is presently scheduled for July 30, 2020 at 4:50am PDT. More details, updates, and livestreams of the event are available on NASA's official launch page: bit.ly/Mars2020Launch. Dig deep into the science of the Mars 2020 mission and the Perseverance rover at: mars.nasa.gov/mars2020/. Find out even more about past, present, and future Mars missions at nasa.gov.



Caption: Perseverance inspects a cluster of interesting Martian rocks with its instruments in this artist rendering by NASA JPL/Caltech

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 (\$10). 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): Must be 18 or older.

_____ 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 (<http://www.trivalleystargazers.org/privacy.shtml>).

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