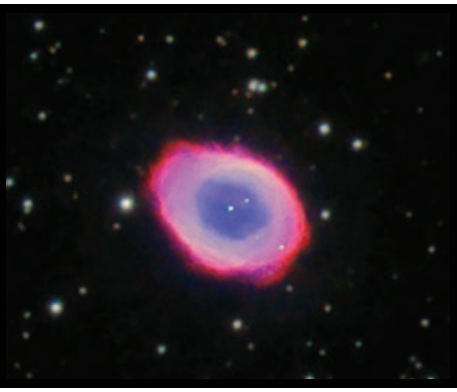
PRIMEFOCUS

Tri-Valley Stargazers

January 2019



Meeting Info

What:
Binoculars, Backwards and Forwards

Who:
Rich Combs

When:
January 18, 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

January Meeting

Binoculars, Backwards and Forwards By Rich Combs

Even before shopping for your first telescope, investing in a good binocular is a great way to get started in astronomy. Like the Loch Ness Monster however, there are many facts and fallacies surrounding binoculars. And like the question "What is the best telescope?", the question "What is the best binocular?" is user, and application, dependent. Can you really buy a good binocular for $49.95? Our speaker will have us looking forwards, backwards, and inside out through these devices to answer this question. Starting with the basics such as, "Do you even need an eyepiece to see an image?" (Nope!) to understanding the field stop, exit pupil, eye relief, interpupiliary distance, Porro vs. roof prisms, and much more, we'll be ready to spend some time on collimation and construction details. Along the way we will demonstrate some practical techniques for using and testing the binoculars you own or are considering buying. Bring anything from your child's plastic toy binoculars to your Leica or Zeiss units, and we'll take them for a spin. As a side effect, this will also help you in choosing your next eyepiece!

Image Caption: Bushnell 7x35mm widefield binoculars, Coronado 10x25mm binoculars with built-in white light solar filters, and Canon 12x36mm image stabilized binoculars. Credit: Ken Sperber

Rich has recently become the past president of TVS, and so now has time to pursue his hobby of looking backwards through binoculars and telescopes. An avid amateur telescope maker, he spent 32 years working on various laser systems at LLNL. A lifetime member of TVS, he has to admit that on cold January nights he prefers to talk about binoculars, rather than stand outside all night using them.

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
Jan. 18	Jan. 21	
Feb. 15	Feb. 18	Jan. 25
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 12/16/18, our club's checking account balance is $15,118.97.

TVS Welcome to New Members

TVS would like to welcome new members Nancy Montgomery and Destiny-Ciara Yano. Please say hello and chat with them at upcoming club meetings.

Time to Renew Club Membership for 2019

TVS membership is open to anyone with an interest in astronomy. Amateurs and professionals are equally welcome; skilled amateurs comprise the majority of the membership. You do not have to own a telescope in order to become a member.

Those renewing their club membership are encouraged to do so by using the online application before the end of December. The term of membership is one calendar year - January through December. The regular club membership remains a bargain at $30. Student membership (High School or College) is only $5! Alternatively, Patron Membership, which grants use of the club's 17.5" reflector at H2O, is available at the annual rate of $100.00.

You can join TVS or renew your membership online at: www.trivalleystargazers.org/membership.shtml After filling out the application form you are connected to the PayPal payment form. You do not need to have a PayPal account to pay online, since PayPal will accept credit cards. Everyone is encouraged to use the online application. Alternatively, you can mail in the Membership Application on the last page of this newsletter along with a check to the Tri-Valley Stargazers, P.O. Box 2476, Livermore, CA 94551-2476. Note that TVS will not share your information with anyone. We only use the e-mail address to notify you when the newsletter becomes available.

All members agree to hold the 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 Holiday Party A Great Success!

The TVS holiday party was attended by about 45 people, with the main meal prepared by Jill Evanko. The meal included moist turkey and tender beef with all the fixings! Member contributions were heavy on the dessert-side, but there were no complaints. A raffle of donated astronomically-themed door prizes was also held, with about 20 people walking away with fun gifts!

Image Caption: Club President Roland Albers spreads cheer in announcing the lucky winner of a door prize! Image Credit: Ken Sperber

Calendar of Events

January 14, 7:30pm

What: Another Pale Blue Dot: The SETI Institute's Search for Exoplanets
Who: Dr. Franck Marchis, 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.

In only two decades, we've gone from the mere speculation about planets beyond our solar system ("exoplanets") to being able to observe them through a variety of methods. Dr. Franck Marchis, Planetary Astronomer and chair of the exoplanet group at the SETI Institute, will discuss new and sophisticated projects which aim to image directly those exoplanets. Future instruments could soon deliver an image of a

Header Image: M57, the Ring Nebula, imaged by Hilary Jones. Hilary used an RCX400 10" telescope and a DSI-PRO II camera. At 60 seconds/image, the total exposure duration was 122 minutes (LRGB=60:17:15:30).

Calendar of Events (continued)

cousin of Earth, or another Pale Blue Dot, a planet similar to our own.

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

January 20, 6:00pm - Midnight

What: Total Lunar Eclipse Viewing
Who: Family Night
Where: Chabot Space and Science Center, 10000 Skyline Blvd., Oakland, CA 94619
Cost: $8/person, Members Free, includes Hot Chocolate

Weather permitting, bundle up and join hundreds of community members who flock to Chabot to get above the urban light pollution to view the spectacular Total Lunar Eclipse Open areas for viewing, so lawn chairs and blankets are encouraged. The penumbral phase begins at 6:36pm, the partial phase begins at 7:34pm, totality starts at 8:41pm, totality ends at 9:43pm, partial phase ends at 10:55pm, penumbral phase ends at 11:48pm.

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

February 2, 5:30pm-8:30pm

What: San Jose Astronomical Association Imaging Workshop
Who: Glenn N.
Where: 16541 Uvas Rd, Morgan Hill, CA (GPS: 37.091536, -121.719594)
Cost: Free

SJAA is proud to sponsor this outdoor workshop where we help those folks who are interested in learning about the mechanics of astrophotography and Imaging. All events will now be held at Little Uvas Open Space Preserve, instead of Coyote Valley. This is a darker spot, much better for nighttime photography and astroimaging. The location is a dirt road and field to park in, no modern conveniences although sometimes there is a porta potty, but not always.

Please arrive BEFORE sunset. The gate should be "dummy locked" so you can open it, enter, and close it behind you. You can park in the flat field to your left just after you drive in. There are horses loose in the field, PLEASE be careful opening the gate and be sure to close it behind you so the horses don't end up on the busy road! Don't assume the person(s) behind you will close the gate. Please check that they do or do it yourself. You can leave anytime, just again be careful with the gate/horses and close the gate behind you.

I usually give an hour talk about the different kinds of night time photography, then after full dark, demonstrate deep space astrophotography (Nebulae, Galaxies, Globular Clusters, etc.).

Bring your questions, and/or your complete astrophotography rig (battery powered).

For more information see: https://www.meetup.com/SJ-Astronomy/events/257517759/

Journal Club By Ken Sperber

The Saturn Nebula: MUSE Observations

My favorite type of object to observe is planetary nebulae. In fact, the first Astronomical League Observing Program that I

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The Saturn Nebula: ESO Very Large Telescope/MUSE

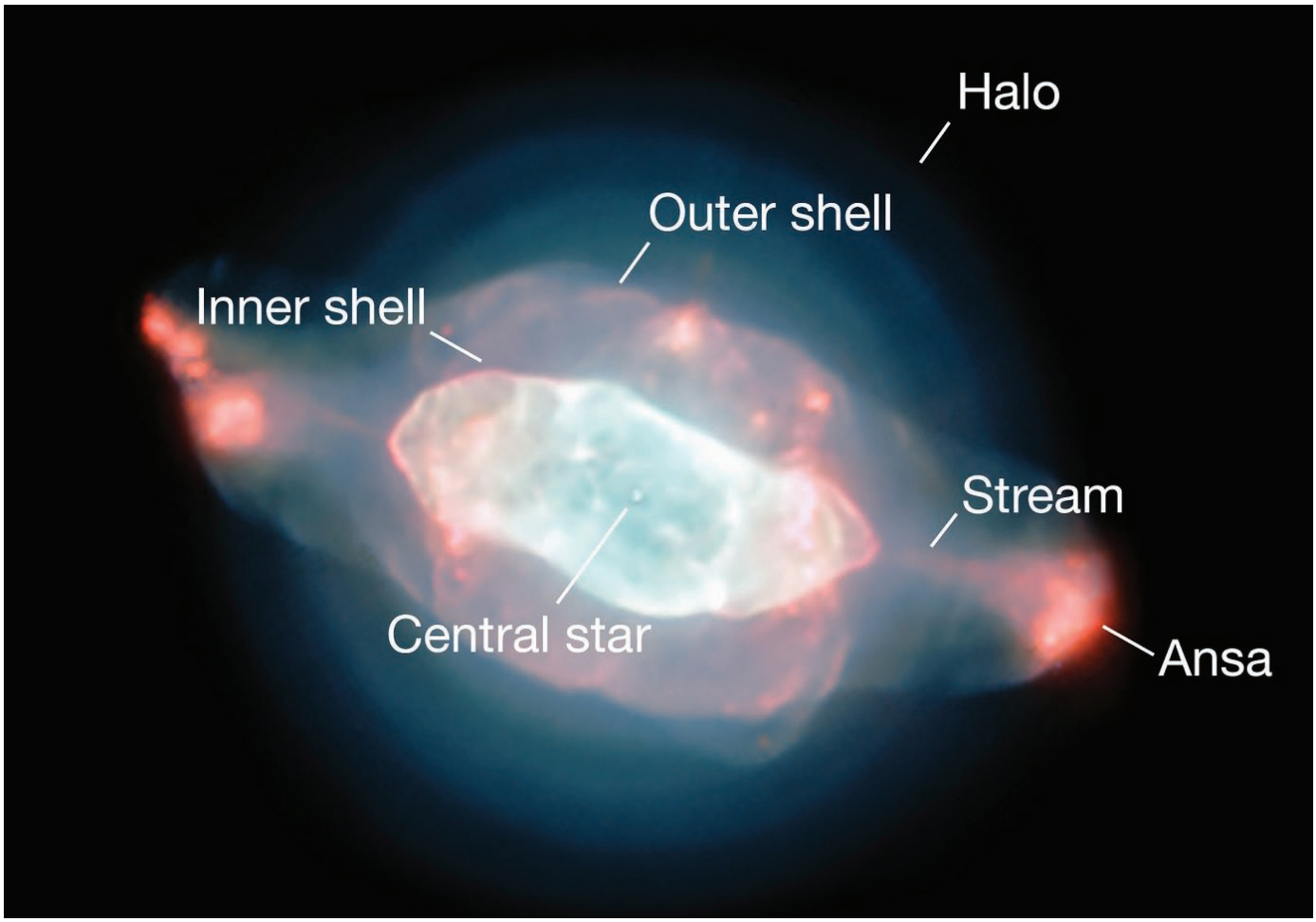

Image Caption: The spectacular planetary nebula NGC 7009, or the Saturn Nebula, emerges from the darkness like a series of oddly-shaped bubbles, lit up in glorious pinks and blues. This colourful image was captured by the powerful MUSE instrument on ESO's Very Large Telescope (VLT), as part of a study which mapped the dust inside a planetary nebula for the first time. Credit: ESO/J. Walsh.

Journal Club (continued)

completed was to report of my observations of 110 Planetary Nebula, and 4 Challenge Objects. Hilary Jones of TVS also completed the Astronomical League Planetary Nebula Program, but he did it photographically! His excellent images, including the sensitivity to using special filters, can be found at: http://www.darklights.org/gallery/pn/index.html For completing these observations and images, Hilary and I each received an advanced observing certificate and pin from the Astronomical League.

Don't let the name fool you, Planetary Nebulae have nothing to do with planets. In early telescopic observations (c. 1780) by William Herschel and Antoine Darquier de Pellepoix, they likened the nebulae to resemble planets. Many Planetary Nebulae (PN's) appear a diffuse circular objects, resembling Uranus, or Neptune, for example. Today we know that planetary nebulae are Sun-like stars that are at the end of their lives. When a star in the 0.8-8 solar mass range gets to the point when fusing hydrogen to helium in not maintained at a steady rate, the core shrinks and heats up, increasing the rate of fusion to balance the force of gravity. At the same time the outer layers of the star expand and it becomes a Red Giant Star. The star develops strong winds that blow off the outer layers of the star, during which the star can lose up to 70% of its mass. Eventually the hot core a the star is revealed, typically exceeding a temperature of 30,000 Kelvin. At such high temperatures there is enough ultraviolet light emitted to cause the blown off atmosphere to fluoresce, and a Planetary Nebula has been formed. The planetary nebula phase is a very brief phase in the life of a star, only lasting about 20,000 to 50,000 years!

One of the most beautiful planetary nebulae I have observed is the Saturn Nebula, NGC7009, located about 5000 light years distant. It is aptly named since it appears Saturn-like in shape. In my September 27, 2013 observation at 127x, I noted "The PN is easily found, exhibiting a blue color. It is

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Planetary Nebulae: Hubble Space Telescope

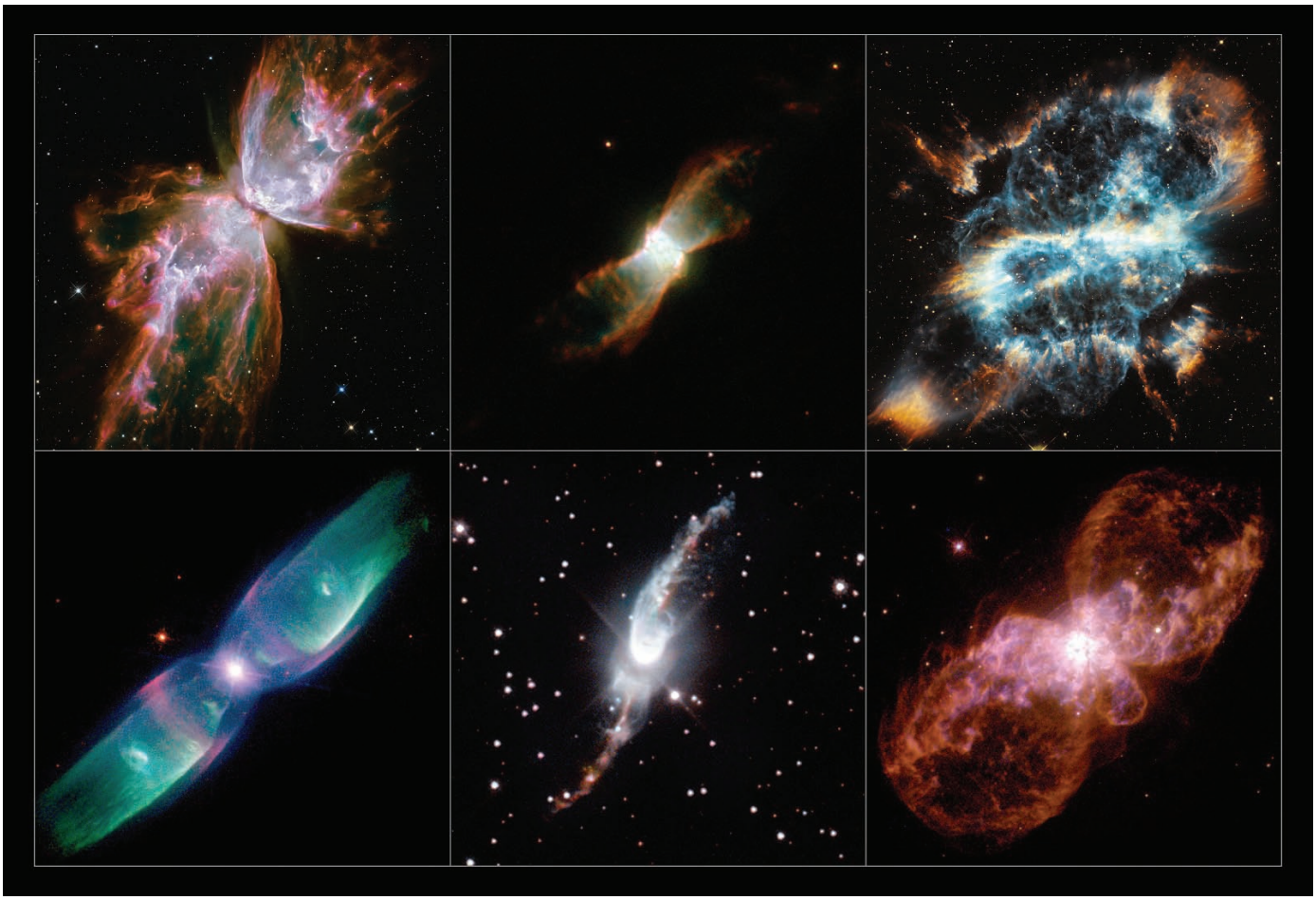

Image Caption: This mosaic shows a selection of stunning images of bipolar planetary nebulae taken by Hubble. A new study using Hubble observations has found that bipolar planetary nebulae located towards the central bulge of our Milky Way appear to be strangely aligned in the sky — a surprising result given their varied histories. The nebulae shown here were not involved in this new study, but demonstrate the varied forms of these spectacular objects. Row 1 (from upper left): NGC 6302, NGC 6881, NGC 5189; Row 2 (from lower left) : M2-9, Hen 3-1475, Hubble 5. Credit: ESA/Hubble & NASA; NGC 6302: NASA, ESA and the Hubble SM4 ERO Team, NGC 6881: ESA/Hubble & NASA, NGC 5189: NASA, ESA and the Hubble Heritage Team (STScI/AURA), M2-9: Bruce Balick (University of Washington), Vincent Icke (Leiden University, The Netherlands), Garrelt Mellema (Stockholm University), and NASA/ESA, Hen 3-1475: ESA/Hubble & NASA; Hubble 5: Bruce Balick (University of Washington), Vincent Icke (Leiden University, The Netherlands), Garrelt Mellema (Stockholm University), and NASA/ESA. See: https://www.spacetelescope.org/images/heic1316b/

elongated east-west, and appears like Saturn with blurry rings." At 159X I noted that "the ends of the projections taper to sharp points." It was best seen using an Oxygen III filter at 159x, where I noted that "Spikes are visible, and the PN appears to have a more diffuse halo surrounding it." For comparison, The European Southern Observatory/ Very Large Telescope Multi-Unit Spectroscopic Explore (VLT MUSE) image of NGC7009 is shown on p. 4, and discussed below. In stars that are massive enough, fusion can form heavy elements, including oxygen. When dispersed in a PN, the oxygen fluoresces at two visible wavelengths, 496 and 501 nanometers. By using an OIII filter, the light at other wavelengths is suppressed and the contrast of the PN improves relative to the background stars-usually revealing more subtle details of its morphology.

As one can see in the Hubble Space Telescope images on p. 5, planetary nebulae come in a wide variety of shapes. In some cases the PN forms within a binary star system. The interaction of the orbiting secondary star with the outflow of the PN forms a choke-point, and when the PN is seen from the side it appears as an elongated bipolar PN, of which several examples are seen above. Alternatively, if you are looking down the barrel, so to speak, you would see an object that best resembles the Ring Nebula, M57 (see the header image on the cover page, taken by Hilary Jones).

To gain a better understanding of NGC7009, Walsh et al. (2018, Astronomy and Astrophysics, 620, A169) have used the MUSE instrument on the VLT, located at the European Southern Observatory at Paranal, Chile. As the name suggests, VLT/MUSE captures detailed images at a wide variety

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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

January

11	Fri	Algol at minimum brightness for 2 hours centered on 10:21pm PST
13	Sun	First-Quarter Moon (10:46pm)
20	Sun	Full Moon: Total Lunar Eclipse Visible; see January S&T, p.18 (9:16pm)
22	Tue	Venus within about 2.5° of Jupiter and Antares 8° away (Dawn)
23	Wed	Saturn appears low in the southeast; binoculars suggested (Dawn)
27	Sun	Last-Quarter Moon (1:10pm)
30	Wed	Venus and Jupiter are flanked by the Moon and Saturn (Dawn)

February

1-2	Fri-	Antares, Jupiter, the crescent Moon, and Saturn form an arc 35° long (Morning)
3	Sun	Algol at minimum brightness for 2 hours centered on 8:55pm PST
4	Mon	New Moon (4:04pm)
10	Sun	The crescent Moon is 6° to the lower-left of Mars (Evening)
12	Tue	Mercury emerges from superior conjunction. Look in the south-southwest; binoculars help (Dusk)
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)

of spectral wavelengths, with hundreds of emission lines detected, to understand how the wide-variety of elements have been dispersed in the PN. In addition to oxygen, a wide variety of elements fluoresce in PN, such as helium, nitrogen, sulphur, chlorine, and manganese. The relative concentrations of the elements provide insight into the pathways by which fusion occurs and information about the strength, duration, and frequency of the stellar winds that dispersed the outer atmosphere of the star while it was on the Asymptotic Giant Branch of stellar evolution.

The main structures of the Saturn Nebula consist of the central star, the inner shell, the outer shell with its bright anse (the spikes in my observation), and a halo. The lead author states in a published interview that "The study revealed that these structures represent real differences in properties within the nebula, such as higher and lower density, as well as higher and lower temperatures." The second author, Ana Monreal Ibero, stated "The presence of dust within a nebula could also be deduced from the change in color between different emission lines of hydrogen. Our team found that the distribution of dust in the nebula is not uniform, but shows a drop at the rim of the inner gas shell. This result suggests sharp changes in the ejection of dust during the last death rattles of the solar-type star or, alternatively, of local dust formation and destruction." Another important observation was that Helium was NOT found to be uniformly distributed, as predicted by current theories of the formation of Planetary Nebulae.

For the more information and the ESO VLT/MUSE image of The Saturn Nebula see: https://www.eso.org/public/usa/news/eso1731/?lang

A video of the MUSE images a function of wavelength can be found at: https://www.eso.org/public/videos/eso1731b/

"Cosmic Butterlies" by Sun Kwok gives an excellent plain language discussion of Planetary Nebula. It is beautifully illustrated with many pictures of PN to demonstrate the wide variety of morphologies in which they come. See: https://www.amazon.com/Cosmic-Butterflies-Colorful-Mysteries-Planetary/dp/0521791359

For those of you wishing to channel your inner physicist, I recommend "The Origin and Evolution of Planetary Nebulae," also by Sun Kwok. It delves deeply into the physics of these fascinating objects. See: https://www.amazon.com/Evolution-Planetary-Nebulae-Cambridge-Astrophysics/dp/052103907X

NASA Night Sky Notes

January's Evening Eclipse and Morning Conjunctions

By David Prosper

Observers in the Americas are treated to an evening total lunar eclipse this month. Early risers can spot some striking morning conjunctions between Venus, Jupiter, and the Moon late in January.

A total lunar eclipse will occur on January 20th and be visible from start to finish for observers located in North and South America. This eclipse might be a treat for folks with early bedtimes; western observers can even watch the whole event before midnight.

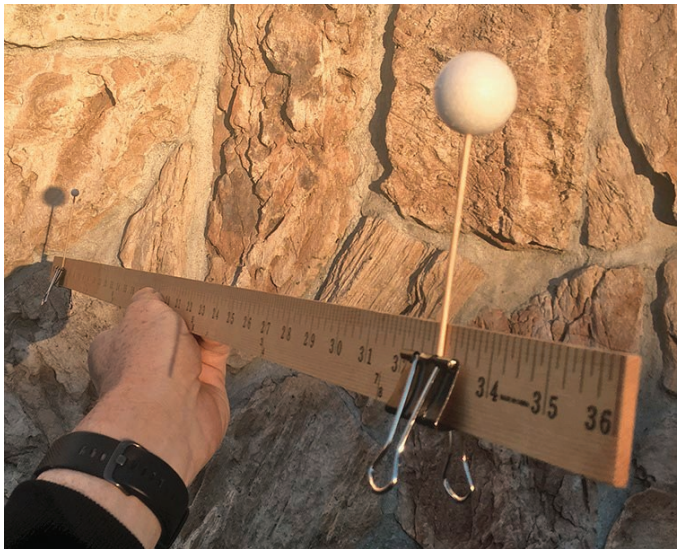

Image Caption: Have you ever wondered how eclipses occur? You can model the Earth-Moon system using just a couple of small balls and a measuring stick to find out! The "yardstick eclipse" model shown here is set up to demonstrate a lunar eclipse. The "Earth" ball (front, right) casts its shadow on the smaller "Moon" ball (rear, left). You can also simulate a solar eclipse just by flipping this model around. You can even use the Sun as your light source! Find more details on this simple eclipse model at bit.ly/yardstickeclipse

Lunar eclipses take several hours to complete and are at their most impressive during total eclipse, or totality, when the Moon is completely enveloped by the umbra, the darkest part of Earth's shadow. During totality the color of the Moon can change to a bright orange or red thanks to the sunlight bending through the Earth's atmosphere - the same reason we see pink sunsets. The eclipse begins at 10:34 pm Eastern Standard Time, with totality beginning at 11:41 pm. The total eclipse lasts for slightly over an hour, ending at 12:43 am. The eclipse finishes when the Moon fully emerges from Earth's shadow by 1:51 am. Convert these times to your own time zone to plan your own eclipse watching; for example, observers under Pacific Standard Time will see the eclipse start at 7:34 pm and end by 10:51 pm.

Lunar eclipses offer observers a unique opportunity to judge how much the Moon's glare can interfere with stargazing. On eclipse night the Moon will be in Cancer, a constellation made up of dim stars. How many stars you can see near the full Moon before or after the eclipse? How many stars can you see during the total eclipse? The difference may surprise you. During these observations, you may spot a fuzzy cloud of stars relatively close to the Moon; this is known as the "Beehive Cluster," M44, or Praesepe. It's an open cluster of stars thought to be about 600 million year old and a little under 600 light years distant. Praesepe looks fantastic through binoculars.

Mars is visible in the evening and sets before midnight. It is still bright but has faded considerably since its closest approach to Earth last summer. Watch the red planet travel through the constellation Pisces throughout January.

Venus makes notable early morning appearances beside both Jupiter and the Moon later this month; make sure to get up about an hour before sunrise for the best views of these events. First, Venus and Jupiter approach each other during the third full week of January. Watch their conjunction on the 22nd, when the planets appear to pass just under 2 ½ degrees of each other. The next week, observe Venus in a close conjunction with a crescent Moon the morning of the 31st. For many observers their closest pass - just over half a degree apart, or less than a thumb's width held at arm's length - will occur after sunrise. Since Venus and the Moon are so bright you may st1ill be able to spot them, even after sunrise. Have you ever seen Venus in the daytime?

If you have missed Saturn this winter, watch for the ringed planet's return by the end of the month, when it rises right before sunrise in Sagittarius. See if you can spot it after observing Venus' conjunctions!

Catch up on all of NASA's past, 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.