Tri-Valley Stargazers

October 2023

PrimeFocus

WHEN:

October 20, 2023
Doors open at 7:00pm
Meeting at 7:30pm
Lecture at 8:00pm

WHERE:

Unitarian Church
1893 North Vasco Rd.
Livermore, CA 94551

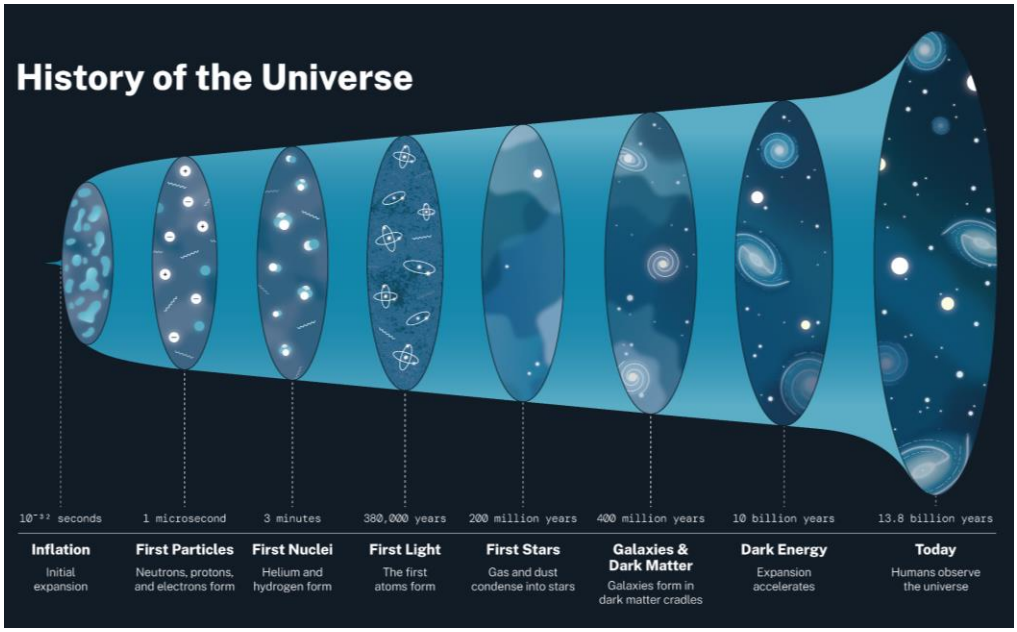
and via Zoom

TVS QR Code

INSIDE THIS ISSUE:

To the Edge and Back - Exploring a Virtual Universe
M. Josh Roberts

Data based virtual models can allow us to explore the Universe beyond the reach of all but our most powerful telescopes. Join M. Josh Roberts on a quick tour of the Depth and Breadth of the Known Universe, followed by audience-led exploration.



Caption: The history of the universe is outlined in this infographic.
Credit: https://universe.nasa.gov/resources/251/history-of-the-universe/?category=universe

M. Josh Roberts found his connection to astronomy through some amazing mentors and a local amateur astronomy group. He went on to take astronomy courses from high school through grad school, completing his bachelor's at San Francisco State University and his master's from Swinburne University.

This passion has taken him from his hometown to the Big City, from California to New York, from Alaska to Chile, and from coastal California to 47,000 ft into the air! Josh takes pride in calling himself an astronomy communicator and a facilitator of that human connection to what exists beyond Earth's atmosphere and can find no greater joy than sharing what he loves about astronomy (and its affiliated sciences) with those who have an interest in hearing it.

TVS Newsletter Editor Position Filled!!!

TVS is thankful that Scott Schneider has volunteered to take over as the new TVS Newsletter Editor, effective January 2024. By night, Scott is an experienced astrophotographer (see his image of the Cocoon Nebula on p.6). By day, Scott runs his own business, Scott Schneider Architecture, designing premium observatories (www.ss-arch.com).

News and Notes

2023-2024 Meeting Dates

Lecture Meeting	Board Meeting	PrimeFocus Deadline
Oct. 20	Oct. 23	Oct. 6
Nov. 17	Nov. 20	Nov. 3
Dec. 15	Dec. 18	Dec. 1
Jan. 19	Jan. 22	Jan. 5
Feb. 16	Feb. 19	Feb. 2
Mar. 15	Mar. 18	Mar. 1
Apr. 19	Apr. 22	Apr. 5
May 17	May 20	May 3
Jun. 21	Jun. 24	Jun. 7
Jul. 19	Jul. 22	Jul. 5
Aug. 16	Aug. 19	Aug. 2
Sep. 20	Sep. 23	Sep. 6
Oct. 18	Oct. 21	Oct. 4
Nov. 15	Nov. 18	Nov. 1
Dec. 20	Dec. 23	Dec. 6

Money Matters

As of the last Treasurer's Report on 09/18/23, our club's account balance is $55,403.75. This includes $26,144.47 in the H2O Rebuild fund.

TVS Welcomes New Members

TVS welcomes new members Raymond Howard, Yanzhe Liu, Monalisa Ray, and Arvind Saravanakumar. Please say hello and chat with them during our meetings.

Time to Renew Club Membership for 2024

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

Those renewing their club membership are encouraged to do so by using the online application before the end of December. Normally our memberships are only good for the calendar year, but anyone joining after October 1st will be given a membership for the remainder of 2023 and all of 2024.

The regular club membership remains a bargain at $30. Student membership (full-time High School or College student) is only $10! To become a key holder to H2O, you must be 18 or older. There is a one-time $20 Key deposit and a $10 annual access fee.

You can join TVS or renew your membership online at: http://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.

2023 Club Star Party Schedule

Save the dates for the 2023 Club Star Parties.

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 Open House star parties are open to only club members and their guests. 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. No gas stations are available on the route, so be prepared. Admission is $3/car-bring exact change. H2O is a primitive site with two porta-potties. Bring water, food, and warm clothing, as needed. Red flashlights are to be used so observers can preserve their night vision.

October 18: Livermore Library, 1188 S. Livermore Ave., Livermore. Set-up at 6:00pm, Introductory Talk at 6:45pm, observing 7:00-9:00pm.

October 19: Outreach school star party at John Green Elementary, 3300 Antone Way, Dublin, set up tentatively 6:15pm, start observing 7:00pm.

October 21: Outreach star party at Del Valle, Arroyo Staging Area, just past 5055 Arroyo Road, Livermore. Set-up at 5:30pm, Observing 6:30-8:00pm.

Calendar of Events

October 20, 27, 28, November 3, 4, 10, 11
7:30pm-10:30pm

What: Free Telescope Viewing
Who: Chabot Staff
Where: Chabot Space and Science Center, 10000 Skyline Blvd. Oakland, CA 94619
Cost: Free

Join Chabot astronomers on the Observatory Deck for a free telescope viewing! Weather permitting, this is a chance to

continued on p.3

Calendar of Events (con't)

explore stars, planets and more through Chabot's historic telescopes. Chabot's three large historic telescopes offer a unique way to experience the awe and wonder of the Universe. Three observatory domes house the Center's 8-inch (Leah, 1883) and 20-inch (Rachel, 1916) refracting telescopes, along with a 36-inch reflecting telescope (Nellie, 2003).

Are the skies clear for viewing tonight? Viewing can be impacted by rain, clouds, humidity and other weather conditions. Conditions can be unique to Chabot because of its unique location in Joaquin Miller Park. Before your visit, check out the Weather Station to see the current conditions at Chabot.

For more information, see:
https://chabotspace.org/events/events-listing/

October 24, 7:15pm-9:00pm

What: Cultural Astronomy
Who: Prof. Bryan Mendez, (SSL)
Where: Lindsay Wildlife Experience Community Room, 1931 First Avenue, Walnut Creek, CA 94597
Cost: Lecture: Free, see link below for parking info

No details available.

For more information, see: nightsky.jpl.nasa.gov/event-view.cfm?Event_ID=125703

November 3, 6:00pm-10:00pm

What: First Friday: Science Obscura
Who: Chabot Staff
Where: Chabot Space and Science Center, 10000 Skyline Blvd. Oakland, CA 94619
Cost: $15 Adults, $5 Youth, Members Free

Did you know there are scientists who study glowing organisms, an agency looking for alien life, and people who are asteroid hunters? This First Friday we will explore the unknown side of science, learning about some of the lesser-known interesting fields of science!

For more information, see:
https://chabotspace.org/events/events-listing/

November 13, 7:30pm

What: Cosmic Alchemy: How Neutron Star Smash-Ups Forge Heavy Atoms
Who: Dr. Enrico Ramirez-Ruiz (UC Santa Cruz)
Where: Golden Gate Park, 55 Music Concourse Drive, San Francisco
Cost: Members and Seniors $12, Public $15

The source of about half of the heaviest elements in the Universe has been a mystery for a long time. Although the general picture of element formation is well understood, many questions about the astrophysical details remain to be answered. The key may lie in the collision of neutron stars—violent, energetic, and unusual events that we are now beginning to observe. This talk will focus on recent advances in our understanding of the origin of the heaviest and rarest elements in the Universe.

For more information, see: Benjamin Dean Astronomy Lecture

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TVS E-Group
To join the TVS e-group just send an email message to TVS at: 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.

Mt. Wilson: Reaching Beyond the Stars, Part 2: A Man, A Vision, and A Legacy; By Saanika Kulkarni

In my previous article (found in *Prime Focus's* September Issue), I talked about Dr. George Ellery Hale and specifically, about his first "large-scale" observatory, the Yerkes Observatory. I mentioned that Hale opted to build the rest of his observatories (Wilson and Palomar) in California. This was for a variety of reasons. First was the location itself. During his honeymoon, Hale visited the Lick Observatory just outside of San Jose and decided that California would be the optimal location for his next expenditure due to its clear skies and plethora of mountain ranges. I had the opportunity to visit both the Mt. Wilson and Palomar sites this summer and, to say the least, I was very amazed! In this article, let's take a closer look at Mt. Wilson and what makes it so stupendous.

A Little Bit About the Site

Located just outside of Pasadena, Mt. Wilson lies in the San Gabriel Mountains at an elevation of just over 5700 feet. It wasn't Hale's idea to use the site (then called Wilson's peak) for astronomy, though. In fact, the site was being used by Harvard University for its 13-inch Clark refractor telescope. Additionally, the University of Southern California (USC) was also interested in building an observatory (its proposed name the Spence Observatory), having ordered a 40-inch Clark refractor. However, USC lost its funding for the site due to the declining economy, and Harvard also pulled out of the site after enduring a particularly brutal winter. Fun fact, the 40-inch Clark mirror USC ordered was bought by Charles Yerkes (where have we heard this name before?). That's right, *the* Yerkes of Yerkes Observatory. Hale (with the help of the University of Chicago) was able to convince Yerkes to buy the mirror and also donate sufficient funds to pay for a building to house it at Lake Geneva, Wisconsin.

Building the Observatory

Hale foresaw the project as an extremely expensive one, and needed to convince people even richer than Charles Yerkes to finance the project. The Carnegie Institute came onto his radar, and so he sought to convince them to fund the project. Fortunately, the Institute was looking to make a profound impact in the field of science, and they agreed to fund the project in its entirety. Hale was ecstatic for this new venture and brought the Snow Solar Telescope from Yerkes to the new site in 1905. While Hale was able to use his famed persuasive skills to get the funding, building the actual observatory was no piece of cake. First, workers didn't have modern automobiles for easy transport of materials. Secondly, and most importantly, they didn't have a road for transportation. Something definitely had to be done about that. So, they constructed the Mount Wilson Toll Road (if you've ever been to the site, probably using the Red Box road, the toll road is on the backside of the mountain), a 12-foot wide (initially 4 feet!) road which was used for transportation of all materials, including the telescope mirrors. Now to address the issue of no automobiles. With the exception of the 60-inch and 100-inch mirrors, mules were used to transport construction supplies up and down the 17-mile round trip road (Fig. 1). As you can imagine, this was not an easy journey and mules often died due to exhaustion and dehydration. Nevertheless, the work for the 60-inch telescope was completed in 1908; the 100-inch was completed in 1917.

Figure 1: A buggy on the Mt. Wilson Toll Road. Credit: Wikipedia

The Observatory

At first, Hale intended Mt. Wilson to be a solar observatory (because Hale was a solar astrophysicist). Because of this, the first telescope there was the 60-foot focal length Snow Telescope, which uses a 24-inch concave mirror. This long focal length allowed for high-resolution observations of the Sun and its intricate features. Particularly, the Snow Telescope was used for advancing the understanding of sunspots, solar flares, and solar cycles. In fact, the Snow was used to demonstrate the Zeeman effect in a sunspot (Fig. 2). The Zeeman effect is when strong magnetic fields (which cause sunspots), split the spectral lines we observe from a source. Furthermore, Hale and Mt. Wilson astronomer Seth Nicholson in 1925 showed that the polarity (magnetic orientation) of sunspots reversed every 11 years, and that east-west polarity alignment was mirrored across the solar equator. This and other subsequent findings constituted the Hale-Nicholson law, which is just one of many revolutionary discoveries made at Mt. Wilson. I visited the Snow Solar Telescope and got to meet the volunteer operator, who demonstrated the calibration of the telescope: making sure the exterior mirror was correctly lined up to the sunlight beam.

Hale then decided to expand the observatory to house optical telescopes as well–enter the glass giants! The first large mirror

continued on p.5

on Mt. Wilson was the 60-inch reflector telescope. After being cast, the mirror had to go through a period of gradual cooling; cool too fast, and the mirror would crack or get surface bubbles. Then, it had to be polished with staggering precision and accuracy for optimal operation. Second, the mirror had to be shipped from the St. Gobain Glass Works in France to Yerkes (the mirror was originally purchased by Hale's father for Hale), and then eventually to Pasadena. Finally, to even get the mirror on the mountain, engineers had to design and build a special truck whose wheels could be individually controlled due to the odious nature of the Toll Road. But the benefits and discoveries made on the telescope greatly outweighed the cost of getting it there. For instance, using precise data collected by the 60-inch, Shapley concluded, in a revolutionary discovery, that the solar system was located halfway out from the center of the Milky Way, as opposed to the widely-accepted belief that the solar system was located near the center.

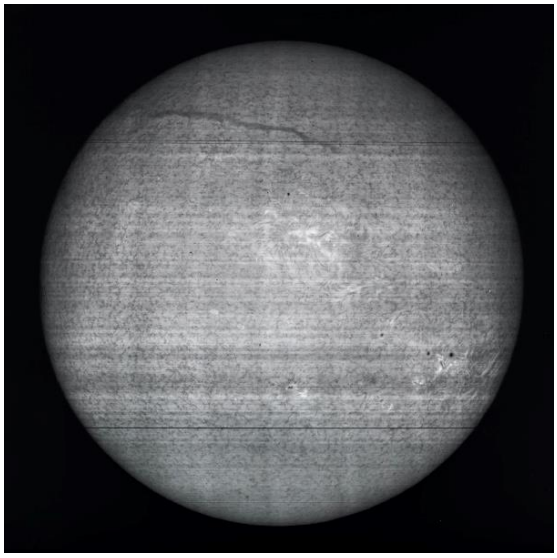


Figure 2: Picture of the Sun taken in 1908 by Ferdinand Ellerman using the Snow Telescope. Notice the swirling patterns near the sunspots. This led to the discovery of magnetism on the Sun. Credit: mtwilson.edu.

The 100-inch Hooker Telescope, with its complexities of design, was an engineering marvel. Firstly, no mirror of this scale had ever been built; it required innovative new molds and cooling processes by the St. Gobain Glass Company. Weighing at a massive 4.5 metric tons, this truly is an engineering marvel. The design of the telescope is also starkly different from the 60-inch. Because of its mass, the conventional mount design couldn't be used–it would simply collapse. For the 100-inch, a closed yolk design was used. This would ensure an equal weight distribution. However, this design had a drawback: the telescope couldn't reach its full range of motion; the mount blocked part of the sky (this tradeoff was later corrected in the 200-inch Hale telescope at Palomar).

Many profound discoveries in astrophysics were made with the Hooker Telescope. The most famous of them was by Edwin Hubble, who discovered the acceleration of the expansion of the universe. Hubble would spend all night (literally all night) at the astronomer's cage of the telescope collecting data on the velocities of galaxies. He then plotted a graph of their distance and their velocities and came to a breakthrough, finding that as the distance of a galaxy from us increases, so does its recessional velocity. Mt. Wilson gained fame in the scientific and even the nonscientific community as it was once thought the universe was expanding but at a constant rate.

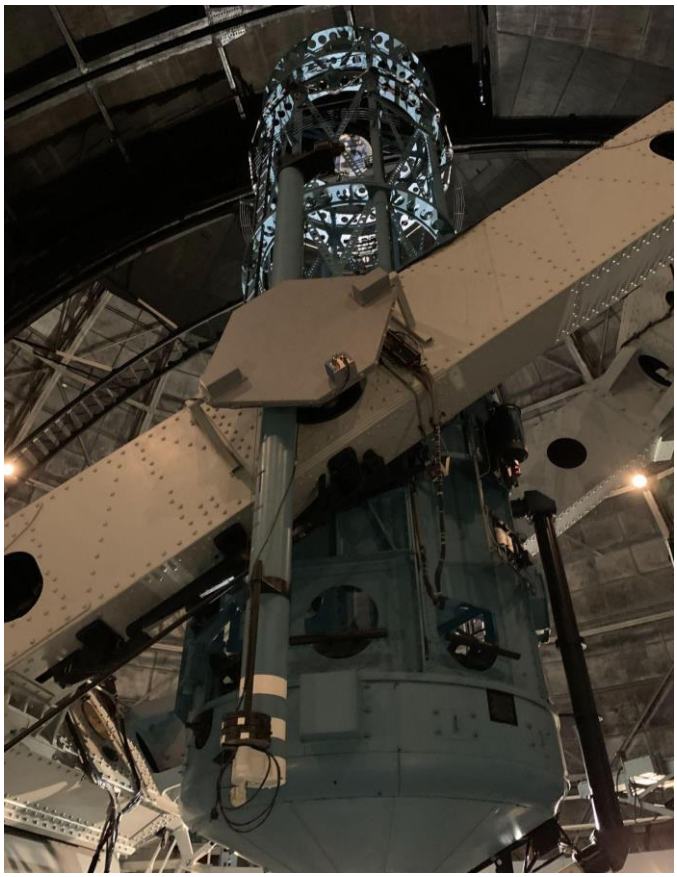


Figure 3: The 100-inch Hooker Telescope, with its closed yoke design mount. Credit: Saanika Kulkarni

In addition to those telescopes, there are smaller telescopes owned by various universities. For example, Georgia State University owns and operates the CHARA array, which consists 6 one-meter telescopes on the Mt. Wilson site. Overall, the experience of going to both Yerkes Observatory and Mt. Wilson gave me a profound sense of Hale's exemplary vision, which he executed perfectly. Though neither the 60-inch telescope nor the Hooker telescope is used for scientific purposes today, they are used for public viewing events and other outreach activities by the Mt. Wilson Foundation in hopes of inspiring new generations of astronomers.

Caption: Aris Pope captured this HOO image of the Monkey Head Nebula. He used a GSO 6" f/4 Imaging Newtonian Telescope with a ZWO ASI1294MC Pro camera with an Optolong 2" L-eXtreme filter. The total integration time was 8h 33m 20s.

Caption: Scott Schneider imaged the Cocoon Nebula (IC 5146) from the TVS Del Valle site. He used an EDGE HD 800 with a 0.7x reducer and a ZWO ASI294MM Pro camera using Astrodon LRGB filters. The total integration time was nearly 12 hours.

What's Up By Ken Sperber (adapted from S&T)

All times are Pacific Daylight Time until November 5, 2am, Pacific Standard Time thereafter

October

14	**Sat**	**New Moon (10:55am, Annular or Partial Eclipse Visible in the Americas, see p.34, Oct. S&T)**
18	Wed	In the SW, the crescent Moon is ~5° from Antares (Dusk)
21	**Sat**	**First-Quarter Moon (8:29pm)**
21-	Sat-	The Orionid meteor shower peaks the night of Oct 21-22 (All Night)
23	Mon	In the SSW, the waxing gibbous Moon is ~5° below Saturn (Evening)
28	**Sat**	**Full Moon (1:24pm)**
28	Sat	In the SE, the Moon is ~2.5° above Jupiter (Evening)
29	Sun	Algol shines at minimum brightness for ~2 hours centered on 10:23pm PDT (Evening)

November

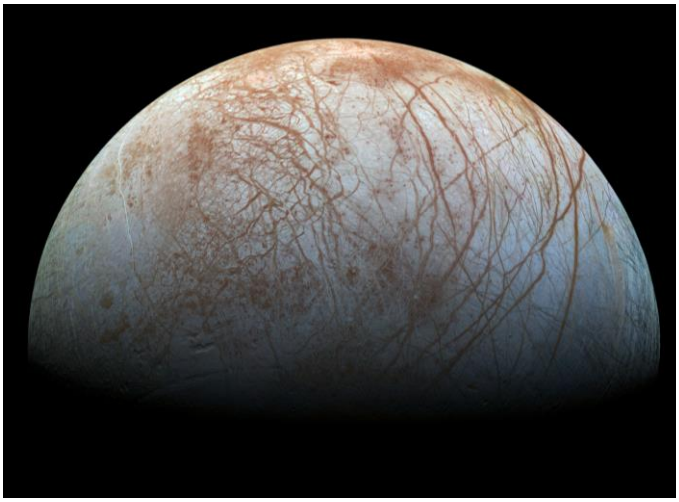
1	Wed	Algol shines at minimum brightness for ~2 hours centered on 7:12pm PDT (Evening)
2	Thu	In the ENE, the Moon is ~6° to the right of Castor and Pollux (Evening)
5	**Sun**	**Last-Quarter Moon (1:37am)**
5	Sun	Daylight Savings Time Ends at 2am
6	Mon	In the SE, the crescent Moon is ~5° above Regulus with Venus to their lower left (Dawn)
9	Thu	In the East, the crescent Moon is ~0.5° from Venus (Morning)
11	Sat	In the ESE, the crescent Moon is ~3° from Spica (Dawn)
13	**Mon**	**New Moon (1:27am)**
17-	Fri-	The Leonid meteor shower peaks the night of Nov. 17-18 (All Night)
20	**Mon**	**First-Quarter Moon (2:50am)**
20	Mon	In the SSE, the Moon is ~5° to the lower left of Saturn (Dusk)
21	Tue	Algol shines at minimum brightness for ~2 hours centered on 7:55pm PST (Evening)
25	Sat	Near the western horizon, the Moon and Jupiter are separated by ~2° (Morning)
26	Sun	In the SE, the Moon is ~1° below M45, The Pleiades (Evening)
27	**Mon**	**Full Moon (1:16am)**
29	Wed	In the ESE, Venus and Spica rise together separated by ~4° (Morning)
30	Thu	In the ENE, the Moon is ~2° below right of Pollux, forming a line with Castor (Evening)

NASA Night Sky Notes

From Galileo to Clipper, Exploring Jupiter's Moons

By Vivian White

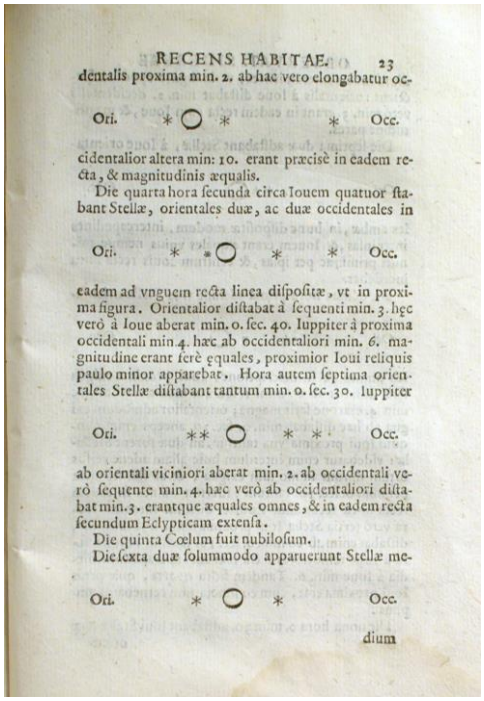
"…We, too, are made of wonders, of great
and ordinary loves, of small invisible worlds,
of a need to call out through the dark."
From In Praise of Mystery: A Poem for Europa by Ada Limon



Caption: This is the color view of Europa from Galileo that shows the largest portion of the moon's surface at the highest resolution. To create this new version, the images were assembled into a realistic color view of the surface that approximates how Europa would appear to the human eye. The scene shows the stunning diversity of Europa's surface geology. Long, linear cracks and ridges crisscross the surface, interrupted by regions of disrupted terrain where the surface ice crust has been broken up and re-frozen into new patterns. https://europa.nasa.gov/resources/29/europas-stunning-surface/

As autumn begins, if you're up late, you may notice a bright point of light rising in the east. Look a bit closer, with a pair of binoculars, and you'll notice it's not a star at all. While stars look point-like no matter how big your backyard telescope, this light appears as a circle under closer examination. Even more curious, you will likely see a line of smaller dots on one or both sides. Congratulations! You've rediscovered the king of the planets - majestic Jupiter - and its four largest moons.

Galileo famously chronicled the four moving dots near Jupiter and surmised that they were orbiting the distant world. While Jupiter has well over 80 discovered moons as of September 2023, these brightest four are called the "Galilean Moons" - Io, Europa, Ganymede, and Callisto. (Great mnemonics exist to remember these in order of distance from Jupiter, such as "I Eat Green Caterpillars") You can follow these like Galileo did, using stargazing apps. The position of the Galilean Moons of Jupiter in October 2023 can be found at: https://in-the-sky.org/jupiter.php. A favorite beginning observing challenge is to track the movement of the Galilean Moons over the course of many nights. Even within a few hours, you will notice them moving in relation to Jupiter, just as Galileo did.



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Caption: Galileo's drawings of Jupiter and its Medicean Stars from Sidereus Nuncius. Image courtesy of the History of Science Collections, University of Oklahoma Libraries

Fast forward 414 years, and NASA will be sending a robotic mission to investigate the surface of one of these distant worlds. The Europa Clipper Mission is launching to the cold, icy moon in 2024, to begin orbiting in 2030. With its salty oceans covered by ice, Europa was chosen as an excellent location to continue the search for life outside of Earth. Clipper will be the largest spacecraft ever sent to another planet, designed to withstand Jupiter's punishing radiation. Once it arrives at Jupiter in 2030, NASA plans to do about 50 flybys of Europa, mapping almost the entire surface of this watery world.

What was once only dreamed of in the small telescope of Galileo, or in great works of fiction, NASA is turning our wildest imagination into reality. One of the celebrated quotes from the classic 2010: Odyssey Two warns, "All these worlds are yours, except Europa. Attempt no landing there." Science fiction fans can feel relieved knowing that writer Arthur C. Clarke gave his blessing for the Europa Clipper mission.

Join the Europa Message in a Bottle Campaign to send your name with the spacecraft, hear the rest of the poem by the US Poet Laureate, and learn more about the wonders of space travel with the Clipper Mission:
https://europa.nasa.gov/participate

Watch a wonderful Clipper webinar with Dr. Cynthia Phillips, planetary geologist with the mission:
https://www.youtube.com/live/RnnLJBLRBCA?feature=shared&t=269

This article is distributed by NASA's Night Sky Network (NSN). The NSN program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit nightsky.jpl.nasa.gov to find local clubs, events, and more!

Tri-Valley Stargazers
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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).

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.