PrimeFocus

September 2024

WHEN:

September 20, 2024
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

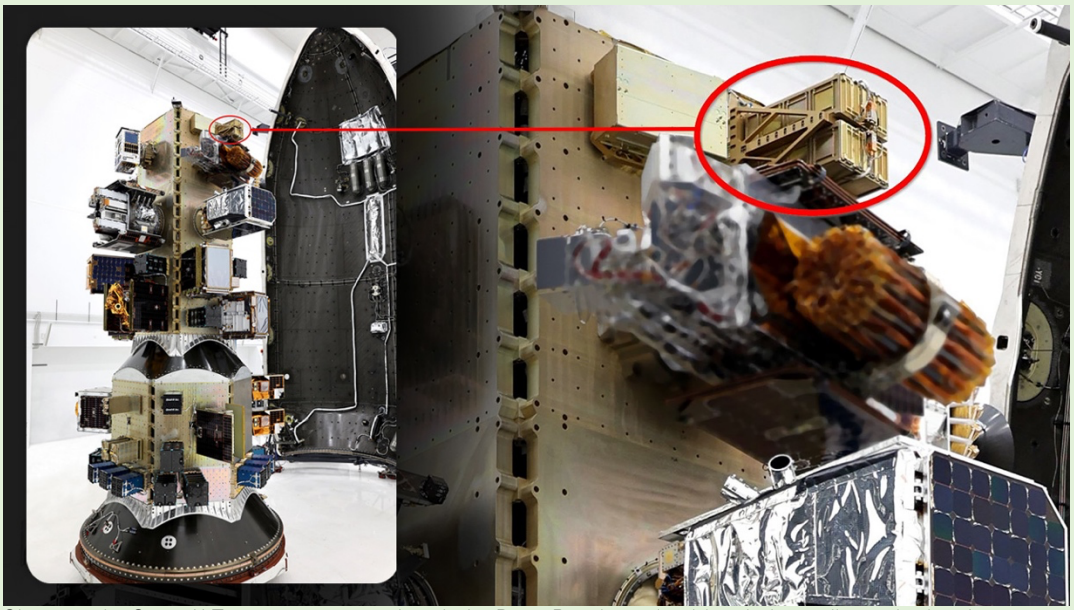
TVS QR CODE

INSIDE THIS ISSUE:

DEEP PURPLE: LLNL UV SWIR SENSOR FOR NASA CUBESAT

FRANK RAVIZZA

Successfully deployed by SpaceX on August 16th, 2024, Deep Purple is an optical sensor for NASA's Platform Technology Demonstration program. It was designed and built by Lawrence Livermore National Laboratory (LLNL) on internal funding in under one year. It will fly on a 6U "Trestles" Terran Orbital satellite called PTD-R with a primary mission to demonstrate new technologies. It features twin 8.5-cm aperture telescopes using LLNL's patented monolithic optics technology that offers high-assurance of diffraction limited performance in a small volume. About the size of a shoe box, its twin apertures are sensitive to Short Wave Infrared (SWIR) and Ultraviolet (UV) light in the 1000-1700 nm and 230-310 nm bands. Its cameras are industrial machine vision commercial off-the-shelf using recent advances in image sensor technology from Sony. Within its 2U payload, Deep Purple also features an Nvidia Jetson ARM and GPU powered payload computer for onboard processing with AI/ML capabilities. The optics housings are fabricated in a compression molded carbon composite material replacing low thermal expansion Invar to provide a one-sixth reduction in mass. Its payload computer will be cooled by a high thermal conductivity carbon composite radiator fabricated using the same process by Patz Materials Technology. Deep Purple's secondary mission will demonstrate low-cost UV astronomy, detection and tracking of near-Earth objects, and ground observation in the SWIR.



Shown is the SpaceX Transporter-11 stack with the Deep Purple payload (circled in red) attached to the Pathfinder Technology Demonstrator-R satellite. (Credit: SpaceX).

Frank Ravizza is an optical engineer at the Lawrence Livermore National Laboratory. Currently, he is lead optical engineer for the Lab's space program that builds optical sensors for space missions. His Lab career started in 2003 as a student intern. His

Continues to Page 2

Deep Purple Continued

history with the Lab extends much further back to when he would come to work with his father. As a young boy he made an impression by helping PhD physicists graph data on their Macintosh. At the end of a long day, he once asked, "Dad: You really get paid to do this?"

Frank aspired to work on the National Ignition Facility, to play a role in the long standing and ambitious effort to achieve fusion ignition—using giant lasers. To Frank, there was nothing cooler—except for driving race cars and flying fighter jets. Both were career ambitions before settling into Lab life. The National Ignition Facility (or "NIF") went on to make global headlines in 2022 for achieving ignition. This means here in Livermore, NIF demonstrated that fusion energy gain in a controlled process is possible, sparking renewed interest in fusion power plants.

Upon graduating with a Bachelors in Optical Science in 2006 from UC Davis, Frank eagerly took the first opportunity to work on NIF as an optical metrology technician. However, Frank soon failed as technician when he began redesigning the Lab, inventing new instruments. One of which became the subject of his Master's Thesis completed in 2013 from University of Arizona. This instrument is still vital to the operation of the NIF because it locates flaws on optics that act like microlenses and damage downstream optics by intensifying laser light. A decade later, when introduced to gravitational microlensing by an astrophysicist, Frank immediately recognized: Yes, I have experience designing instruments to find microlenses!

In 2014, Frank was recruited internally to work on a high average power laser that promised to provide boost phase missile defense. Another really cool laser, but not for fusion—for shooting down missiles. Frank became beam quality modeling lead for this project. In 2019, Frank was again recruited internally, this time to the Lab's rapidly growing space program. Today, Frank spends much of his time thinking of creative ways to capture data for astrophysics in the most efficient and cost-effective way possible.

NEWS AND NOTES

2024 Meeting Dates

Club Meeting	Board Meeting	PrimeFocus Deadline
Sept. 20	Sept. 23	Sept. 3
Oct. 18	Oct. 21	Oct. 5
Nov. 15	Nov. 18	Nov. 2

Money Matters

As of the last Treasurer's Report on 7/22/24, our club's account balance is $46,726.02, this includes $13,102.47 in the H2O Rebuild fund.

TVS Welcomes New Members

TVS welcomes new members Chad Linke, Matt Welsh, Vijay Kumar, Madhan Guna, and Jennifer Dang. Please say hello and chat with him during our meetings.

2024 TVS Club Star Party Schedule

Save the dates for the 2024 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 (Coords: 37.6196638, -121.7528899). The public is invited for the first 1.5-2 hours, while club members can stay the remainder of the night.

November 9: Club/public star party at Del Valle Arroyo Road Staging Area. Set-up at 4:00pm, Observing 5:00 until 6:30pm. Club members are welcome to stay later after the public leaves.

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.

October 26: Tesla Vintner's Star Party, 5143 Tesla Rd., Livermore. Set-up at 6:00pm, Observing 6:15-11-30pm.

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.

Sept 28: H20 Open House, at 5pm the caravan to H2O PROMPTLY leaves the corner of Mines and Tesla Rds., Livermore. Observing until 11:30pm.

Oct 4: School Star Party at Valley Christian School, Valley Christian Elementary School, 7500 Inspiration Drive, Dublin. Setup 6:30pm, Observing from 7:00pm - 9:00pm. Weather permitting, we should have good views of the moon and Saturn, check TVS group calendar for

more info.
https://groups.io/g/trivalleystargazers/viewevent?eventid=2409694&calstart=2024-10-04

CALENDAR OF EVENTS

September 20, 21, 27, 28 October 4, 5, 11, 12, 18, 19, 7:30-10:30 PM

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 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 7, 7:30 PM

What	Unraveling the Mysteries of the Sun's Atmosphere
Who	California Academy of Sciences
Where	Morrison Planetarium; 55 Music Concourse Drive, San Francisco, CA 94118
Cost	Public: $15; Members and seniors: $12

The Sun, our nearest star, is more than just a blazing ball of fire. Its atmosphere, hotter than its already scorching surface, presents a puzzle that has intrigued scientists for years. How does the Sun's magnetic field heat its chromosphere to 10,000 degrees—and its corona to more than a million degrees? This enigma holds significant implications for Earth, as the Sun's corona hosts powerful explosions and eruptions that can trigger space weather events affecting our technology-dependent society. From mesmerizing auroras to disruptions in communication systems and satellite operations, the Sun's activity touches our daily lives in unexpected ways.

This talk will delve into the recent strides made in understanding the Sun's atmospheric dynamics. Thanks to breakthrough observations from space-based telescopes such as NASA's IRIS and SDO, coupled with advancements in supercomputing, we are gaining deeper insights into the mechanisms driving solar heating. Moreover, we will explore the upcoming frontier in solar research, with future observatories including NASA's MUlti-slit Solar Explorer (MUSE) mission poised to revolutionize our understanding of the Sun's behavior and its impact on our planet and beyond.
Bart De Pontieu is a solar physicist whose research focuses on using high-resolution observations and numerical simulations to understand the physical processes that cause the rapid rise of temperatures from 10,000 degrees to millions of degrees in the low solar atmosphere. He is a Fellow at Lockheed Martin's Solar & Astrophysics Laboratory which is part of Lockheed Martin Advanced Technology Center (LM ATC) in Palo Alto, California. Dr. De Pontieu is the principal investigator for NASA's Interface Region Imaging Spectrograph (IRIS), a solar-observing small explorer satellite mission built by LM ATC which has been observing the Sun's atmosphere since its launch in 2013. He is also the principal investigator of the new MUlti-slit Solar Explorer (MUSE) mission, a solar-observing medium class explorer satellite mission to be launched in a few years.

Dr. De Pontieu started his career in astrophysics as a teenage amateur astronomer in Belgium, with a passion for observing meteors and artificial satellites. He studied physics engineering at the University of Ghent, Belgium, and got his PhD in astrophysics at the University of Ghent and Max Planck Institute for extraterrestrial physics in Garching, Germany. After a postdoc at Stanford University, he has been at Lockheed Martin since 1999 where he has worked on many solar physics satellite missions, including TRACE, Hinode, Solar Dynamics Observatory, IRIS, MUSE, and Solar-C. He is also an adjunct professor at the Institute of Theoretical Astrophysics at the University of Oslo.

For more information, see:
https://www.calacademy.org/events/benjamin-dean-astronomy-lectures/unraveling-the-mysteries-of-the-suns-atmosphere

October 9, 7:00 PM

What	Finding Life Out There -- What do Religions Think
Who	Silicon Valley Astronomy Lecture Series. Sponsored by The Foothill College Science, Tech, Engineering & Math Division, The SETI Institute, & The Astronomical Society of the Pacific.

Where Online: http://www.youtube.com/SVAstronomyLectures
Cost Free

Astronomers have now discovered thousands of planets in orbit around other stars. Dr. Weintraub will discuss those discoveries, and predict the progress astronomers are likely to make in their more detailed studies of these planets over the next fifty years. Then he will consider the consequences of those potential discoveries for Roman Catholicism, Mainline Protestantism, Christian Creationism, Seventh Day Adventism, Judaism, Islam, and Hinduism -- for all of which the discovery of a planet with life on it may be profound. The 20th century visionary Buckminster Fuller said, "Sometimes I think we're alone. Sometimes I think we're not. In either case, the thought is staggering."

This presentation is built on the ideas published in Weintraub's book Religions and Extraterrestrial Life: How Will We Deal With It? (2014) -- in which he interviewed leaders of all these faiths.

Dr. David A. Weintraub is Professor of Astronomy Emeritus at Vanderbilt University where he founded and directed the Communication of Science and Technology program, and conducted research on the formation of stars and planets. He is the 2015 winner of the Klopsteg Award from the American Association of Physics Teachers, which recognizes the outstanding communication of contemporary physics to the general public and is a 2023 Fellow of the American Astronomical Society. His most recent book is The Sky is for Everyone: Women Astronomers in Their Own Words (2022; with Virginia Trimble). Previous books include Life on Mars: What to Know Before We Go (2018), How Old is the Universe? (2010), and Is Pluto a Planet? (2006). He also created the Who Me? series of inspirational scientific autobiographies for fifth-grade level readers (from World Scientific Publishing), which helps young people see themselves as scientists.

For more information, see:
https://www.meetup.com/A-A-N-C/events/303379331?utm_medium=email&utm_source=braze_canvas&utm_campaign=mmrk_alleng_event_announcement_prod_v7_en&utm_term=promo&utm_content=lp_meetup

November 4, 7:30 PM
What Seeing Beyond Sight: Astronomical Images and the Aesthetics of the Sublime
Who California Academy of Sciences
Where Morrison Planetarium; 55 Music Concourse Drive, San Francisco, CA 94118
Cost Public: $15; Members and seniors: $12

Over the last several decades, astronomers have used the Hubble Space Telescope to look deep into the Universe, a practice that continues with the James Webb Space Telescope. The images from these instruments, as well as those from ground-based telescopes and space probes, have introduced us to a celestial plentitude: pictures of galaxies that glitter with millions of points of light and nebulae that reach upward as giant gaseous columns; panoramas of Martian landscapes and close-ups of its geological features; aerial views of Jupiter's swirling clouds and Saturn's many rings in brilliant hues; visual reconstructions of black holes outlined in glowing orange.

Such cosmic pictures are based on scientific data, but they must address a vexing question: How to represent what our lies beyond our sight? This talk will consider how the aesthetics of astronomical images aid in the task. In particular, it will trace a recurring engagement with the rhetorical and visual tropes of the sublime, whether a resemblance to 19th-century landscape paintings of the American West or a reprise of the psychedelic styles of 1960s counterculture. Through the aesthetics of the sublime, astronomical images convey the awesomeness of reaching beyond our sensory limits, even as the familiarity of these tropes tame or contain the potentially terrifying aspects of transcendence

Elizabeth A. Kessler is Advanced Lecturer in American Studies at Stanford University. Her research and teaching focus on 20th- and 21st-century American visual culture. Her diverse interests include: the role of aesthetics, visual culture, and media in modern and contemporary science, especially astronomy; the interchange between technology and ways of seeing and representing; the history of photography; and the representation of fashion in different media. Her book, Picturing the Cosmos: Hubble Space Telescope Images and the Astronomical Sublime, on the aesthetics of deep space images, was published in 2012. Her work has also appeared in Aperture, Technology and Culture, The Journal of Visual Culture, and other publications. She is currently writing a book on the anticipation and astronomy, as well as a second on portraiture in Silicon Valley.

For more information, see:
https://www.calacademy.org/events/benjamin-dean-astronomy-lectures/seeing-beyond-sight-astronomical-images-and-the-aesthetics

MY EXPEREINCE IN THE UCI COSMOS PROGRAM
AVEESH AGRAWAL

What is Cosmos?
COSMOS is a residential summer program held by UC Colleges in California which aims to provide students with not only an incredible learning opportunity, but the full college experience. From architecture to astronomy, this program offers a wide range of courses which students can apply to and learn about from actual professors at different UC's. I applied to the UCI COSMOS program to learn about the Expanding Universe and the Subatomic Particles that make up our universe. From learning about Photon to Galaxies, this was an amazing program that I was incredibly lucky to be a part of.

The Coursework and Field Trips
Our coursework included topics ranging from quantum mechanics to cosmology. Although it deals with a lot of physics, this cluster actually did not require a physics background. So, when learning about these topics, we learnt either the very basics of it as to not dive into the physics side or we skimmed over the physics. In cosmology, we studied the cause (dark energy) of the expansion of the universe. We dove into topics dealing with what physicists think might happen in the future as the universe keeps expanding, will it stop? Will it start to shrink? Taking a step back, we also studied about particles that make up our universe such as muons, nuons, and photons.

We went on 2 different field trips during the course of the program, the first being to TAE Technologies and the second being to Palomar Observatory which houses the 200-inch George Hale Telescope. Though both were extremely fun, I personally found the Palomar Observatory to be slightly more interesting as I am more interested in the field of astrophysics.

This is a picture of what the Hale Telescope looks like. The COSMOS group was allowed to enter the observatory from the back entrance to walk right next to the telescope. Credit Aveesh Agrawal

The Final Project
For the final project, I chose to research the mass of dark matter within the Andromeda Galaxy. The way my group

Continues to Page 6

My Experience continued

and I calculated this mass was by first determining the total mass of Andromeda from which we could then subtract the total mass of all the luminous objects within the galaxy. Our results came fairly close to other research which stated it to be around 0.8-1.1 * 10^12 solar masses (we determined it to be 1*10^12 solar masses). We plotted graphs of the rotational curve taking the total and luminous mass of Andromeda, wrote out our methods, and wrote our conclusions to make a poster and slideshow.

The slideshow would be presented to every other student within my cluster (cluster 4), the professors and Teacher-Assistants, and actual undergrad students at UCI. The Presentation was absolutely nerve-wracking but exciting at the same time. On the other hand, the poster would be presented to parents who were invited to walk through a poster session displaying projects worked on by people of all clusters.

The College Experience

From sitting in actual lecture rooms to living in the dorms, COSMOS provided me with an experience that I can never forget. It was a lot more freedom than what I was used to and really gave me a sense of how I might manage myself in college. There were a lot of things that I had to get used to which I had grown accustomed to at home such as laundry and being woken up.

The program gave me an ample amount of time to really explore the UCI campus. Even during work time, we were allowed to go to the science library and work in their study rooms. The campus, although not as big as other UC's, was extremely beautiful. It has a giant park in the middle, which is an amazing place to hang out, study, or take a walk around.

OFFICERS AND VOLUNTEER POSITIONS

Officers

President
Ron Kane
president@trivalleystargazers.org

Vice-President
Eric Dueltgen
vice_president@trivalleystargazers.org

Treasurer
John Forrest
treasurer@trivalleystargazers.org

Secretary
David Lackey
secretary@trivalleystargazers.org

Past President
Roland Albers
past_president@trivalleystargazers.org

Volunteer Positions

Astronomical League Rep.
Don Dossa
alrep@trivalleystargazers.org

Club Star Party Coordinator
Eric Dueltgen
coordinator@trivalleystargazers.org

Del Valle Coordinator
David Wright
delvalle@trivalleystargazers.org

Historian
OPEN
historian@trivalleystargazers.org

Librarian
Ron Kane
librarian@trivalleystargazers.org

Loaner Scope Manager
Ron Kane
telescopes@trivalleystargazers.org

Newsletter
Scott Schneider (Editor)
Saanika Kulkarni (Contributing Editor)
newsletter@trivalleystargazers.org

Webmaster
Swaroop Shere
webmaster@trivalleystargazers.org

Night Sky Network Rep.
Ross Gaunt
nnsn@trivalleystargazers.org

H2O Observatory Director / Rebuild Chairman
Chuck Grant
H20@trivalleystargazers.org

Observing Program Coordinator
Ron Kane
awards@trivalleystargazers.org

Outreach Coordinator
Eric Dueltgen
outreach@trivalleystargazers.org

Potluck Coordinator
OPEN
potluck@trivalleystargazers.org

Program Coordinator
Dan Helmer
programs@trivalleystargazers.org

Publicity and Fundraising
OPEN
publicity@trivalleystargazers.org

Refreshment Coordinator
OPEN

Web and Email
www.trivalleystargazers.org
info@trivalleystargazers.org

TVS E-Group
To Join the TVS E-Group just send an email to TVS at info@trivalleystargazers.org asking to join the group. Make sure you specify the email address you want to use to read and post to the group.

TVS ASTROPHOTOGRAPHY

VdB 141, The Ghost Nebula, by Aris Pope
For a full resolution image see https://www.astrobin.com/hm3s6v/B/

M33, The Triangulum Galaxy, by Ashish Joshi
For a full resolution image see https://www.astrobin.com/88gwtz/

M20, The Trifid Nebula, by Imran Badr
For a full resolution image see https://www.astrobin.com/37vz3r/

NGC 7331, Stephan's Quintet, by Gert Gottschalk
Click the link to see more of Gert's Photography https://www.trivalleystargazers.org/gert/Astro_en.htm

WHATS UP

Adapted from Sky & Telescope

All times are Pacific Standard Time

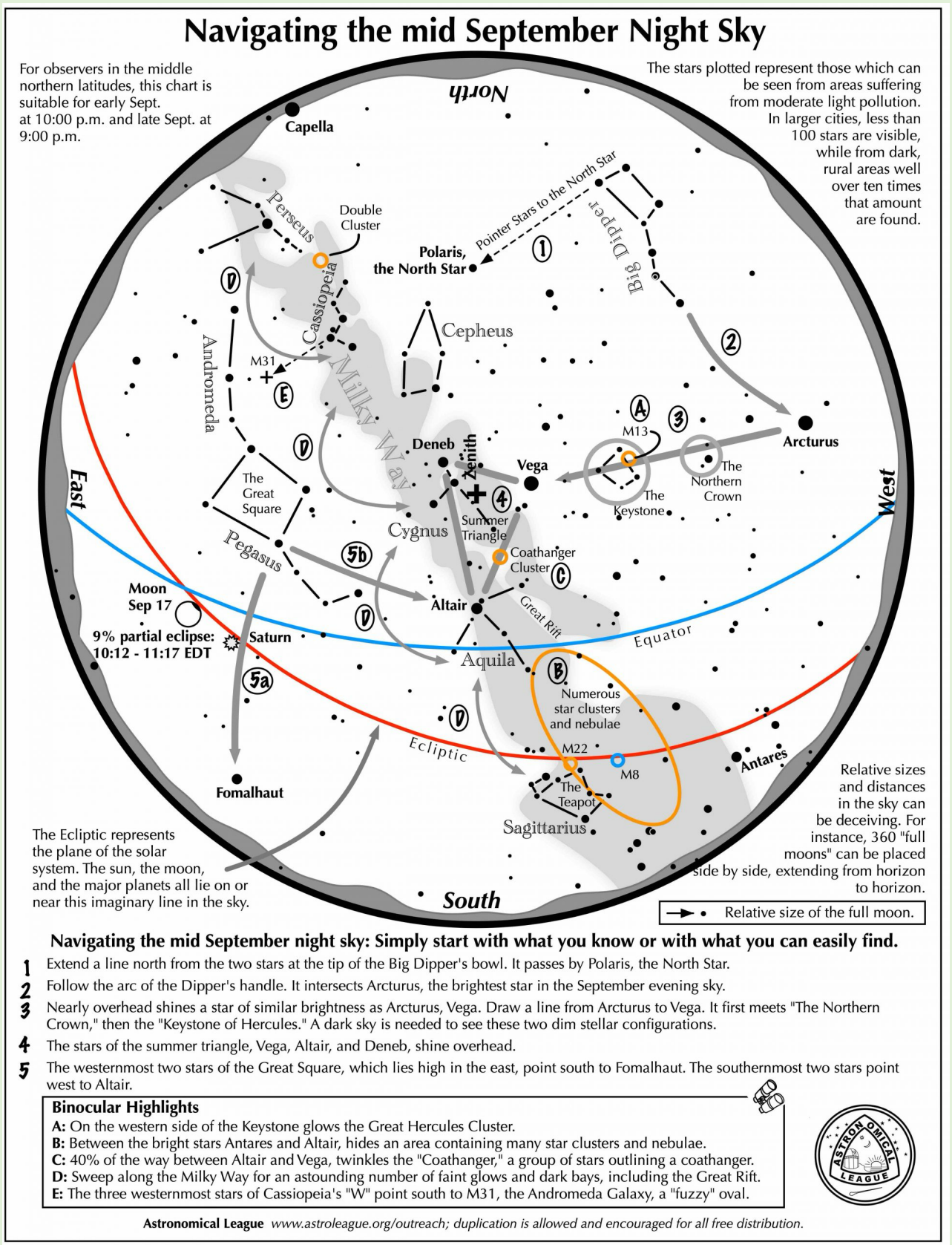
September 2024

17	**Tue**	**Full Moon**
20	Fri	Algol shines at minimum brightness from about 9:42pm to 11:42pm
22	Sun	A morning wanning gibbous Moon passes through the Pleiades while high in the southwest
24	Tue	Moon is at third quarter
25	Wed	At dawn the waning crescent moon is about 4° upper left of Mars.
29	Sun	At dawn, thin lunar crescent is 1½° below Leo's brightest star Regulus

October 2024

1	Tue	Looking east, about two hours before sunrise, for the next two weeks for the soft glow of the zodiacal light.
2	**Wed**	**New Moon**
5	Sat	Moon is 4° left of Venus low near the west-northwest horizon at dusk
7	Mon	At dusk looking south-southwest see the lunar crescent about 2° left of Antares
10	Thu	Moon is at first quarter
13	Sun	Algol shines at minimum brightness from about 8:00pm to 10:00pm
14	Mon	Looking southwest, waxing gibbous moon is about 3½° lower left of Saturn
17	**Thu**	**Full Moon**

NAVIGATING THE NIGHT SKY FOR SEPTEMBER



Download pdf here: https://www.astroleague.org/wp-content/uploads/2024/08/2024-September.pdf

NASA NIGHT SKY NOTES

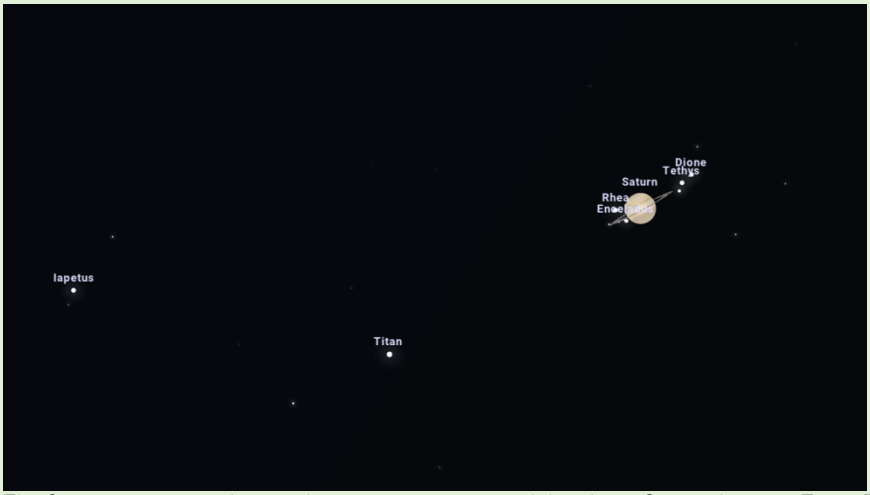
Marvelous Moons
By Kat Troche of the Astronomical Society of the Pacific

Title image of Jupiter's largest moons, from left to right: Io, Europa, Ganymede, Callisto. Credit: NASA

September brings the gas giants Jupiter and Saturn back into view, along with their satellites. And while we organize celebrations to observe our own Moon this month, be sure to grab a telescope or binoculars to see other moons within our Solar System! We recommend observing these moons (and planets!) when they are at their highest in the night sky, to get the best possible unobstructed views.

The More the Merrier

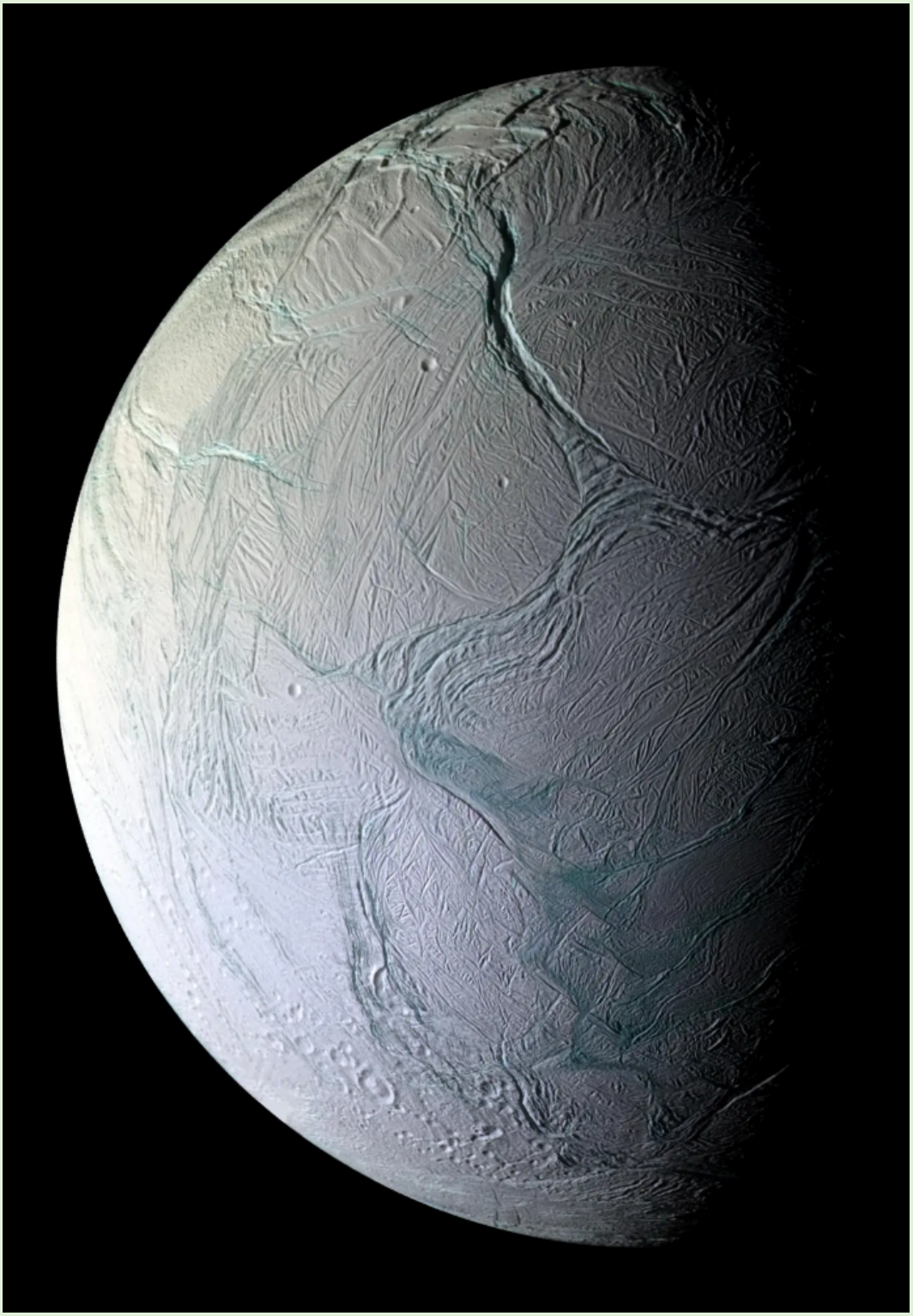
As of September 2024, the ringed planet Saturn has 146 identified moons in its orbit. These celestial bodies range in size; the smallest being a few hundred feet across, to Titan, the second largest moon in our solar system.



The Saturnian system along with various moons around the planet Saturn: Iapetus, Titan, Enceladus, Rhea, Tethys, and Dione. Credit: Stellarium Web

Even at nearly 900 million miles away, Titan can be easily spotted next to Saturn with a 4-inch telescope, under urban and suburban skies, due to its sheer size. With an atmosphere of mostly nitrogen with traces of hydrogen and

methane, Titan was briefly explored in 2005 with the Huygens probe as part of the Cassini-Huygens mission, providing more information about the surface of Titan. NASA's mission Dragonfly is set to explore the surface of Titan in the 2030s.



This mosaic of Saturn's moon Enceladus was created with images captured by NASA's Cassini spacecraft on Oct. 9, 2008, after the spacecraft came within about 16 miles (25 kilometers) of the surface of Enceladus. Credit: NASA/JPL/Space Science Institute

Saturn's moon Enceladus was also explored by the Cassini mission, revealing plumes of ice that erupt from below the surface, adding to the brilliance of Saturn's rings. Much like our own Moon, Enceladus remains tidally locked with

Saturn, presenting the same side towards its host planet at all times.

The Galilean Gang

The King of the Planets might not have the most moons, but four of Jupiter's 95 moons are definitely the easiest to see with a small pair of binoculars or a small telescope because they form a clear line. The Galilean Moons – Ganymede, Callisto, Io, and Europa – were first discovered in 1610 and they continue to amaze stargazers across the globe.

The Jovian system: Europa, Io, Ganymede, and Callisto. Credit: Stellarium Web

- Ganymede: largest moon in our solar system, and larger than the planet Mercury, Ganymede has its own magnetic field and a possible saltwater ocean beneath the surface.
- Callisto: this heavily cratered moon is the third largest in our solar system. Although Callisto is the furthest away of the Galilean moons, it only takes 17 days to complete an orbit around Jupiter.
- Io: the closest moon and third largest in this system, Io is an extremely active world, due to the push and pull of Jupiter's gravity. The volcanic activity of this rocky world is so intense that it can be seen from some of the largest telescopes here on Earth.
- Europa: Jupiter's smallest moon also happens to be the strongest candidate for a liquid ocean beneath the surface. NASA's Europa Clipper is set to launch October 2024 and will determine if this moon has conditions suitable to support life. Want to learn more? Rewatch the July 2023 Night Sky Network webinar about Europa Clipper here.

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
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).

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.