nightwatch
Newsletter of the Pomona Valley Amateur Astronomers

I will love the light for it shows me the way,
yet I will endure the darkness because it shows me the stars.
Og Mandino

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Volume 44 Number 8 ***nightwatch*** **August 2024**

Club Events Calendar

Aug 7	**Board Meeting**
Aug 16	**General Meeting – Alex McConahay "Through Rose Colored Glasses" - 7:30 PM**
Aug 31	**Star Party – GMARSs**
Sept 11	**Board Meeting**
Sep 20	**General Meeting 7:30 PM**
Sept 28	**Star Party – GMARS**
Oct 9	**Board Meeting 6:15 PM**
Oct 12	**Star Party – Cahuilla Park**
Oct 18	**General Meeting 7:30 PM**
Nov 2	**Star Party – GMARS**
Nov 6	**Board Meeting 6:15 PM**
Nov 15	**General Meeting 7:30 PM**
Nov 27	**Board Meeting 6:15 PM**
Dec 7	**Holiday Party**

PVAA Officers and Board

Officers

President ….....	Mathew Wedel	909-767-9851
Vice President ..	Joe Hillberg	909-949-3650
Secretary	position is currently open	
Treasurer	Gary Thompson	909-935-5509

Board

Jim Bridgewater (2026).....	909-599-7123
Richard Wismer(2026)	
Ron Hoekwater (2025).....	909-706-7453
Howard Maculsay (2025)……	909-913-1195

Directors

Membership / Publicity....	Gary Thompson .	909-935-5509
Outreach	Jeff Schroeder	909-758-1840
Programs	Ron Hoekwater	909-391-1943

PVAA General Meeting 07/19/24

At first, we were locked out of our meeting room, and campus security had to unlock the building and the room. We started a little late, but it all came together in the end. Our first speaker was Gary Thompson with the topic 'What's Up with Rockets' starting with SpaceX. The Falcon 9 was grounded because a StarLink mission was not able to re-light the 2nd stage to boost the satellites to a higher orbit. They released the satellites and turned their ion thrusters on max, but could not overcome the atmospheric drag. Within a few days they all burnt up in the atmosphere, which they are designed to do. The second stage re-entered the atmosphere and burnt up a few days later. SpaceX had 325 successful Falcon 9 launches in a row. This year, as of July 19th, they have launched 69 Falcon 9 rockets, 1 Falcon Heavy, and 2 Starships. They are now preparing for another Starship launch. As of this writing the Falcon 9 is operational again.

SpaceX will be moving their headquarters from California to Texas. No date for that was given.

SpaceX also created their own EVA suit, to be evaluated by doing a spacewalk this year. This will be on the Polaris Dawn mission originally scheduled for July 31st of this year but now scheduled for NET (No Earlier Than) August 26th.

NASA awarded SpaceX a contract worth $843 million to de-orbit the ISS in 2030 or 2031. They will modify a cargo Dragon with an extended trunk, add propellent tanks and 30 Draco thrusters to do the job.

United Launch Alliance (ULA) used to do all the American launches for the United States before SpaceX was founded. This year they have had 3 launches. 1 Atlas launch with Boeing's Starliner as the payload, 1 Delta Heavy launch for the Department of Defense (DOD), and 1 Vulcan launch that sent the Peregrine lander to the moon. This was the first launch of the Vulcan rocket, and the last launch of the Delta Heavy. The Vulcan rocket is designed to replace the Atlas and Delta rockets. They have 70 launches in the queue to keep them busy for a few years.

Rocket Lab is an American Company based in Long Beach. It is actually a New Zealand company incorporated in the U.S. to get DOD contracts. Their Electron rocket has had 8 launches this year. They have added two new launch pads – 1 in the U.S. and one in New Zealand. They are building the Neutron fully reuseable rocket to compete with SpaceX's Falcon 9 and it may have its first launch next year.

The European Space Agency (ESA) launched the Ariane 6 for the first time on 7/6/2024. The launch itself was fine, but the second stage failed to do a planned re-light. They have 30 launches in the queue, most do not require a re-light of the second stage booster.

Ken Elchert was our main speaker, continuing his presentation from last month on the DART mission. He started his presentation with facts on the Jupiter Icy Explorer (JUICE) mission. This is the first interplanetary spacecraft to the outer planets not launched by the U.S. – as ESA launched it on 4/14/2023 from French Guiana. This will be the first spacecraft to orbit a moon other than Earth's Moon. It will also be the first spacecraft to use both the Earth and Earth's Moon in a double gravity assist maneuver.

Ken also reminded us that Apollo 11 landed on the moon 55 years ago. 30 years ago, the comet Shoemaker-Levy fragments impacted Jupiter. 95 years ago, Robert Goddard launched a camera and a barometer as the first payloads on a liquid-fueled rocket.

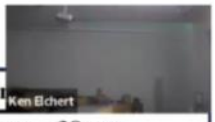
Ken then went into his DART presentation, going briefly over what he covered last week, and then giving us the results of the impact into Dimorpho. The ejecta mass is estimated to be about one million kilograms, which significantly helped change Dimorpho's orbit around Didymos. The orbital period changed from 32 minutes 40.1 seconds to 33 minutes 14.7 seconds. Dimorpho's orbital height changed by 121 feet, from 3,901 feet to 3780 feet. Before the impact, both Dimorpho and Didymos were tidally locked. Now they are not. Eventually they will be again.

ESA is doing a follow-up mission named Hera to get more precise numbers. It will have 3 spacecraft to map Diamorpho, measure its mass, and estimate the momentum transfer efficiency of the DART mission. It is scheduled to launch between October 8th and 25th of this year.

Another mission scheduled to launch in September 2027 is the NEO Surveyor. It will go to the Earth-Sun Lagrange Point #1 to look for near Earth objects.

Gary Thompson

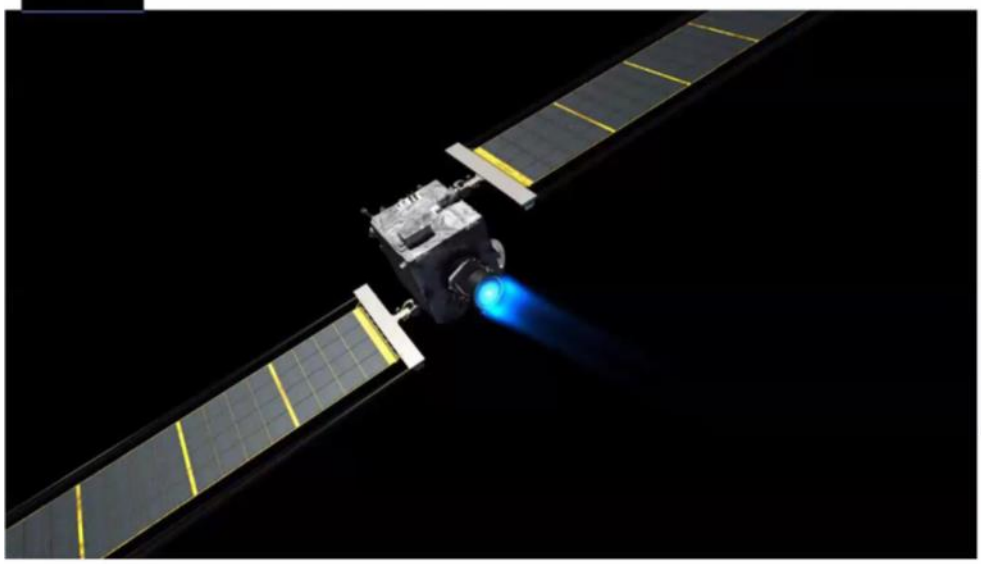
Impact Results



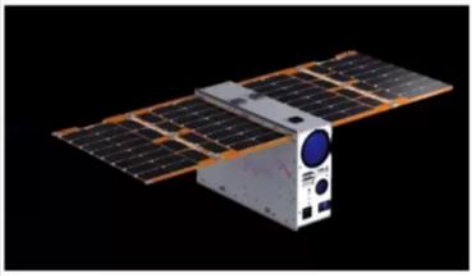
Parameter	Metric	English	Comm
Distance from Earth	10.9 million km	6.773 million miles	1-way comm time = 38 sec
DART spacecraft mass	579.4 kg	1277.36 lb_m	
→ DART Impact Speed	6144.8 m/s = 22,121 km/hr	20,160.1 ft/s = 13,745.5 mi/hr	
DART Impact momentum	3,560,297 kg m/s	25,751,678 ft lb_m/s	
DART Impact energy	10,938,657,000 J	8,067,962,000 ft lb_f	2.6144 tons TNT
Ejecta cone opening angle	125 deg +/-10 deg	125 deg +/-10 deg	
→ Momentum Enhancement, β	3.55 +/-1.35	3.55 +/-1.35	3.61 +/-0.20 if ρ = 2400 kg/m^3
→ Ejecta mass	>1 x 10^6 kg	>2.2 x 10^6 lb_m	0.5% to 1% of Dimorphos's mass
Ejecta momentum*	9,292,375 kg m/s	67,211,880 ft lb_m/s	2.6 x p_{DART}; 72.3% of the total
Total momentum imparted	12,852,672 kg m/s	92,963,558 ft lb_m/s	
Parameter	**Before Impact**	**After Impact**	**Change**
→ Dimorphos's Orbital Period	715 m 17.3 s	682 m 37.2 s to 682 m 02.6 s	-32 m 40.1 s to -33 m 14.7 s**
→ Dimorphos's Orbital Radius	1,189 m = 3,901 ft	1,152 m = 3,780 ft	-37 m = -121 ft
→ Dimorphos's Orbital Velocity	172.75 mm/s	170.12 mm/s	-2.63 +/-0.06 mm/s***
Dimorphos's Shape	Oblate Spheroid	Ellipsoid	

*β = 3.61 assumed
**the criterion for success was / ΔP / > 73 sec
***if the impact had been inelastic, Δv would have been -0.71814 mm/s

Depiction of the DART Spacecraft



DART/Impactor



LICIACube

Image obtained using the HST on Dec. 19, 2022

The bright object with a tail is Dimorphos

The 37 tiny white dots clustered around it are boulders

Magellan Mapper Arrives at Venus

Today is the 34th anniversary of Magellan at Venus. On 10 August 1990 at 17:00:00 UTC, the Magellan Venus Radar Mapper achieved insertion into Venus orbit. Magellan was the first interplanetary spacecraft launched from the Space Shuttle, and the first to test the theory of aerobraking for changing its orbit.

But perhaps most important of all, it provided the first global views of the surface of Venus, which is otherwise completely obscured by dense clouds, and invisible in visible light (although the surface can be imaged from Earth at near infrared wavelengths). Magellan produced high resolution radar maps of the cloud enshrouded surface of Venus, and those radar maps are still the best data we have on the surface topography & geography of Venus.

The mission ended when the spacecraft was becoming no longer usable, and was deliberately burned up in the dense atmosphere of Venus on 13 October 1994. Radio tracking of the trajectory, as Magellan descended and eventually was destroyed, allowed for an in-situ study of the density of the upper atmosphere.

The discoveries concerning craters on Venus are perhaps most interesting. There are no impact craters smaller than about 3 km (1.9 miles) across, because the smaller impactors never make it through the dense Venusian atmosphere.

And the relatively small number of craters, compared to other planetary surfaces, and their pristine condition, implies a surface no more than 300,000,000 to 600,000,000 years old. Planetary scientists think that Venus underwent a global resurfacing event a few hundred million years ago, where the entire planet surface melted and recycled. Venus does not appear to have tectonic plates, like Earth, and so there is no volcanic mechanism along plate boundaries for heat transfer from the interior. So heat just builds up until the cooling effect of a global surface recycling.

The original name for the mission, before being renamed Magellan, was the Venus Orbiting Imaging Radar, acronym VOIR. Of course, "voir" is the infinitive form of the French verb "to see", which would have been a perfect double-entendre acronym, and I have always been bugged by the fact that VOIR did not remain as the name of the mission.

The first image here, from Wikimedia, shows 5 global views of Venus, reconstructed from Magellan radar data. It is a montage of 5 individual images that can be found in the JPL Photojournal website, also linked below. Of course, radar is invisible, so the colors are entirely artificial, likely chosen as a “warm color” to match the roughly 900 °F surface temperature of Venus.

The second image, from NASA, shows the Magellan spacecraft being deployed. The caption reads: “NASA's Magellan spacecraft is deployed from the cargo bay of the Space Shuttle Atlantis in 1989. Magellan was the first planetary spacecraft launched from a space shuttle. Credit: NASA”.

https://en.wikipedia.org/wiki/Magellan_(spacecraft) (Wikipedia)

https://atmos.nmsu.edu/.../atmosphere.../MAGELLAN/venus.html (Planetary Data System, Planetary Atmospheres Node - NASA & New Mexico State University

https://pds-geosciences.wustl.edu/miss.../magellan/index.htm (Planetary Data System, Geosciences Node - NASA & Washington University in St. Louis)

https://www.planetary.org/space-images/magellan-at-venus (The Planetary Society)

https://solarsystem.nasa.gov/missions/magellan/in-depth/ (NASA, Solar System Exploration; Magellan image source)

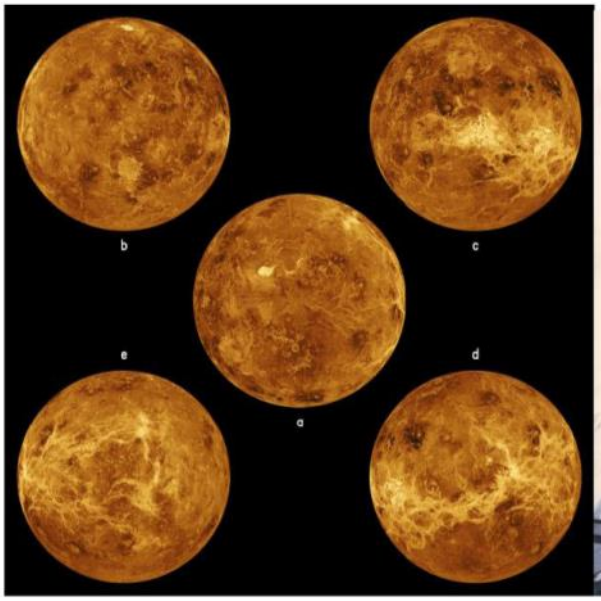
https://nssdc.gsfc.nasa.gov/planetary/magellan.html (NASA, National Space Science Data Coordinated Archive)

https://www.jpl.nasa.gov/missions/magellan/ (NASA/JPL)

https://commons.wikimedia.org/.../File:Magellan_Venus... (Venus Image source)

https://photojournal.jpl.nasa.gov/targetFamily/Venus... (131 Magellan images from the JPL Photojournal archive)

https://en.wiktionary.org/wiki/voir (The French verb "voir")



Tim Thompson – Facebook post 6/10/24

Fireworks Galaxy

Cindy and I went to the Julian Starfest again this year, Friday and Saturday nights, August 2 and 3. This was the third one we attended. Part of the package I purchased included a docent-led tour of the 200" Mount Palomar telescope. It was a fabulous visit, and everyone was impressed with the size of the telescope and the science that is being done with it.

Friday night started out terribly. My set-up would not keep connected, with various equipment disconnects during initial alignment. I lost connection to the camera, the mount, and the router at various points. The most frustrating thing was not being able to connect to the router since I would be facing a complete rerouting of the cables to hard-wire the connections. Fortunately, one of my colleagues allowed me to connect through their router and everything seemed to sort itself out. But I had already lost 4 hours of imaging time by them, so I only got about ¾ the amount of data that I had hoped for.

I decided to image a target that I had last imaged in 2015, NGC 6946, the Fireworks Galaxy. The colorful name derives from the large number of supernovae seen within the galaxy. Ten have been seen since 1917, a rate about 10x that of our Milky Way galaxy. The galaxy lies about 25 million light years away on the border of Cygnus and Cepheus and spans about a quarter of a degree in the sky. At magnitude 9.6, it is well below naked eye visibility. It also lies along the Milky Way's galactic plane and is dimmed by intervening interstellar dust and gas, although you can't tell from this image. The face-on orientation nicely shows the spiral arms and with the galaxy being considered a starburst galaxy, large areas of red and blue star forming regions can be seen. You might want to poke around in the image to see some of the interesting, more distant galaxies. There are several in the lower right quadrant and others scattered throughout the image.

My previous shot was only about 5 hours of data taken with my old set-up of non-setpoint cooled camera and wedge-mounted reflector. This one is 11 hours, 2 minutes of data with a set-point cooled camera and the equatorially mounted 8-inch Ritchey-Chrétien telescope. It's an LRGB image with 84 3-minute luminance frames, 27 5-minute blue and green frames, and 28 5-minute red frames. I'm still shooting at the lowest gain setting but based on the low signal I had in the RGB frames, I may raise the gain somewhat. The frames were all captured

while guiding, which may have led to the sharper spikes around the brighter stars. This time, I stacked the frames using drizzle at 2x to improve detail, and then resampled back to the original size to keep the file size relatively small. I used 21 dark frames, 15 flat frames, and 15 dark flat frames to calibrate the raw images before stacking. Luminance and RGB were processed separately, being combined near the end of processing. Each was stretched after separating the stars from the galaxy and background. My typical processing steps are to deconvolute the base images, then combine the RGB frames to produce a raw color image. Then, the stars are removed from both the luminance and RGB frames and the starless images have noise reduction applied. The RGB is color corrected at this point to balance the background to neutral gray. The starless and star images are then independently stretched and sharpened to a point where I am happy with the detail and contrast. For the RGB frames, I adjust the saturation a little past where I want the final level to be because I will lose a little when the luminance frame is added. Stars are then added back to the starless images and the background is adjusted to a dark gray level. Finally, the luminance and RGB frames are combined with the luminance frames contributing to detail and the RGB frames contributing the color. For this image, final sharpening was done by masking out the background and stars so that only the galaxy was enhanced.
I hope you enjoy the image. Clear skies until next month.

Ron Ugolick

https://www.astrobin.com/users/ruccdu/

NASA Night Sky Notes September 2024

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!

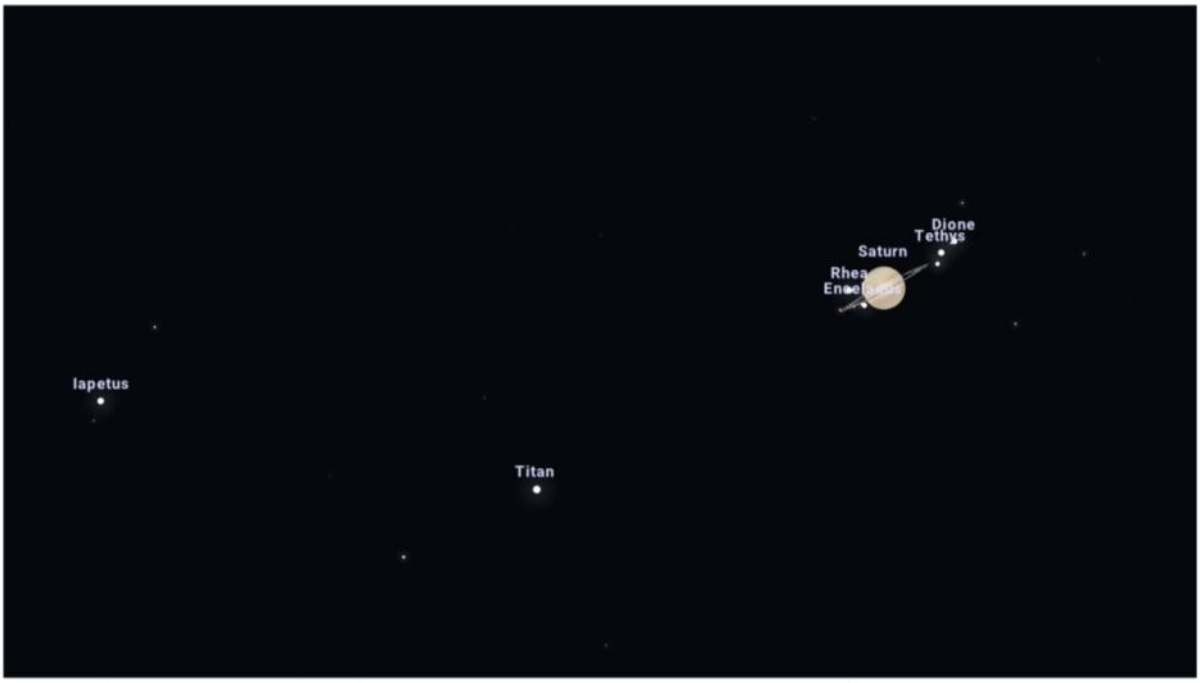
September's Night Sky Notes: Marvelous Moons

By Kat Troche

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

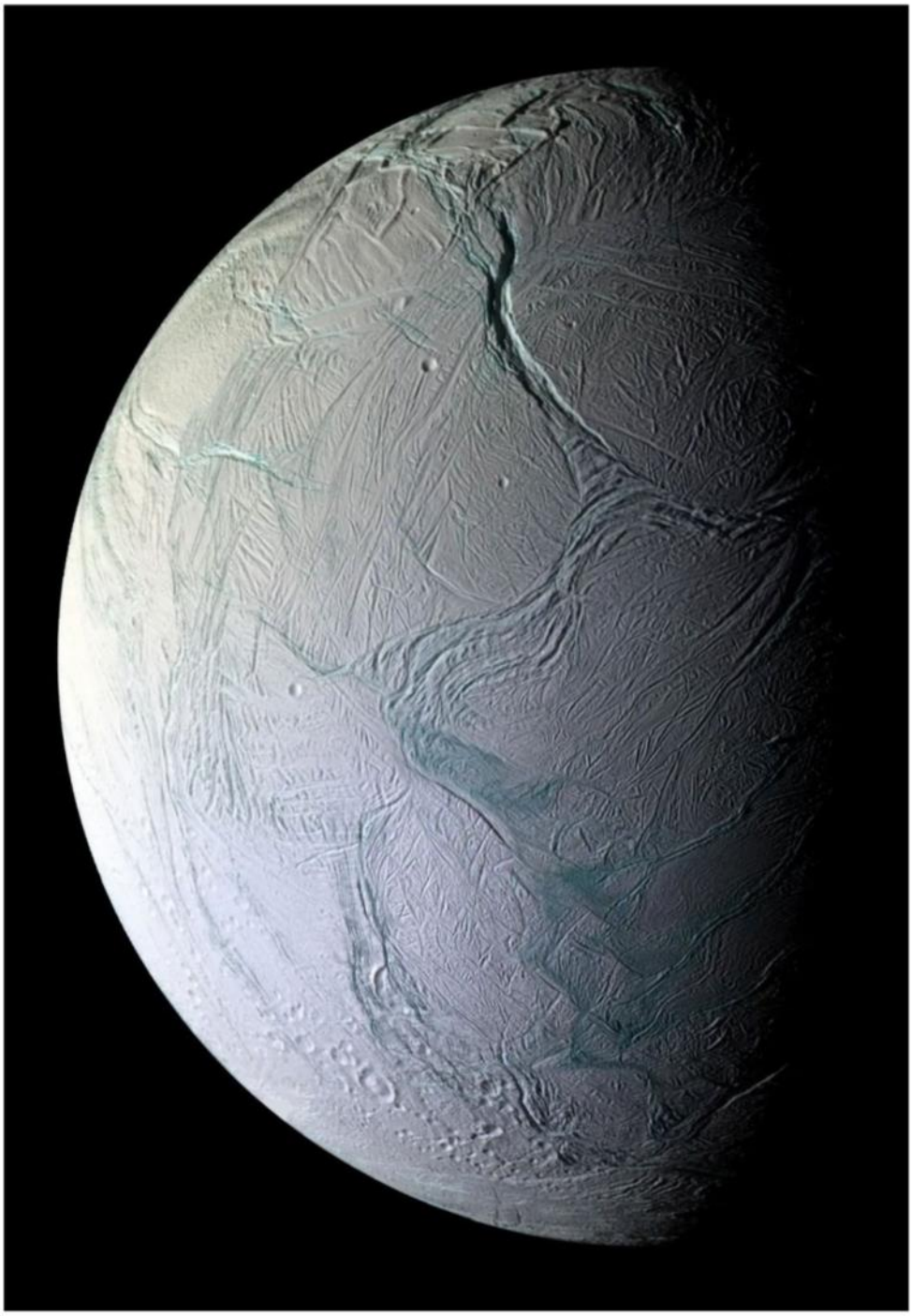
As of September 2024, the ringed planet Saturn has 146 identified moons in its orbit. These celestial bodies range in size; the smallest being a few hundred feet across, to Titan, the second largest moon in our solar system.



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.

NASA Night Sky Notes September 2024

Be sure to celebrate International Observe the Moon Night here on Earth September 14, 2024, leading up to the super full moon on September 17th! You can learn more about supermoons in our mid-month article on the Night Sky Network page!