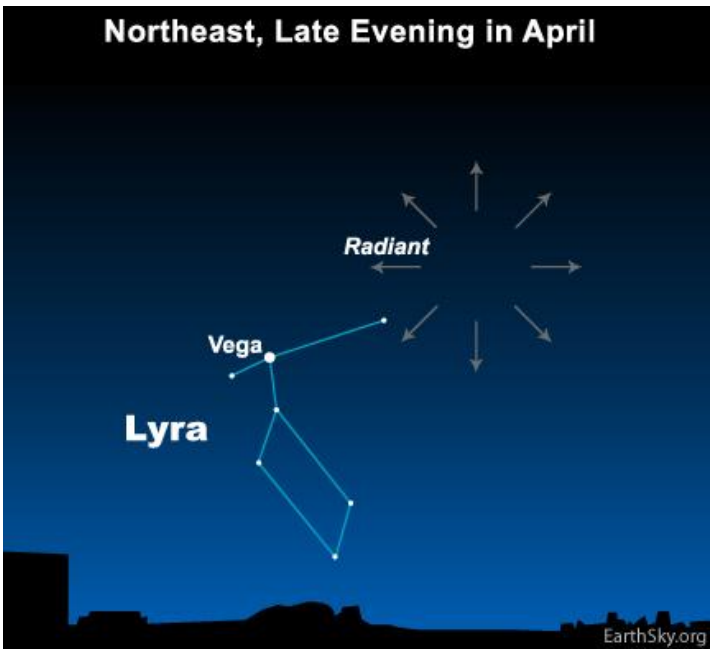
Education & Public Outreach
April 2025, Part 1

April Special Events:

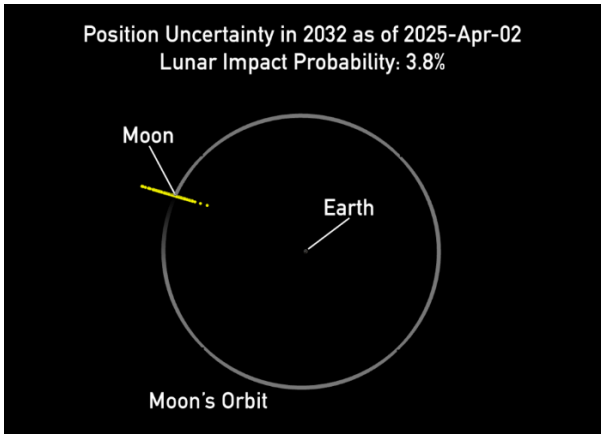


Finally, we have a meteor shower this month, the Lyrid meteor shower that appears to radiate from Lyra, the Lyre. Things do not change from year-to-year, other than occasional predicted outbursts (meteor storms) and the phase of the Moon, so here is what I wrote last year, updated:

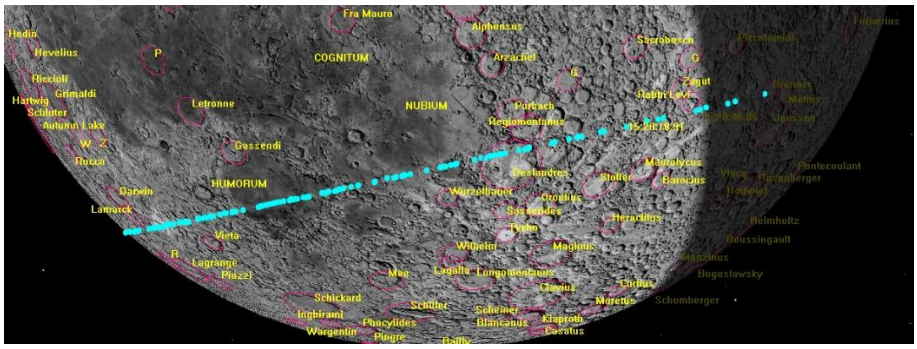
The Lyrid meteor shower is one of the oldest meteor showers with an outburst that was recorded in 687 BC. Outbursts occur about every 60 years. There have been more recent recorded outbursts in 1803 and 1922, so we should have a "normal" shower of about 20 meteors per hour at its peak before dawn on April 22. The shower can be observed for more than a week starting in mid-April (starting in late evening), the best time to observe is around 4:00 a.m. (or a little earlier) on April 22 local time (3:00 a.m. in Arizona and Hawaii). The waning crescent Moon rises about 4:00 a/m. (standard time). The shower is related to Comet Thatcher, a short period comet with an orbital period of 415 years that was discovered in 1861.

Asteroid 2024 YR4 Update:

JWST observed 2024 YR4 twice in March and we now have a good estimate of its size. More observations are scheduled for April 20 and May 16. It has a diameter of 60 meters +/- 7 meters (200 ft). It is similar to S-type asteroids and so is a stony asteroid. Earth is safe but not the Moon. It will fly by the Earth at a nominal distance of 260,000 km. 6.5 hours later, it will pass by the Moon at a nominal distance of 3,100 km (1,400 km from the surface of the Moon). I did some research, and the close approach to the Earth will be visible in the US (at night), as will the close approach to the waning Moon (after the Sun comes up).



The uncertainty of the position of asteroid 2024 YR4 at the time of closest approach to the Moon on December 22, 2032. This represents an uncertainty of +/-1.5 hours.



The nominal closest approach to the Moon is about 3,000 km, so only about 1,300 km from the surface. If it were to strike the Moon, we would be able to see it in the (the Moon will be above the horizon), but it will be in the daylight hours. The chances of hitting the Moon are now about 3.8%, but this uncertainty will change after JWST observes it again.

https://webbtelescope.org/contents/early-highlights/nasas-webb-finds-asteroid-2024-yr4-is-building-sized

https://science.nasa.gov/blogs/planetary-defense/2025/04/02/nasa-update-on-the-size-estimate-and-lunar-impact-probability-of-asteroid-2024-yr4/

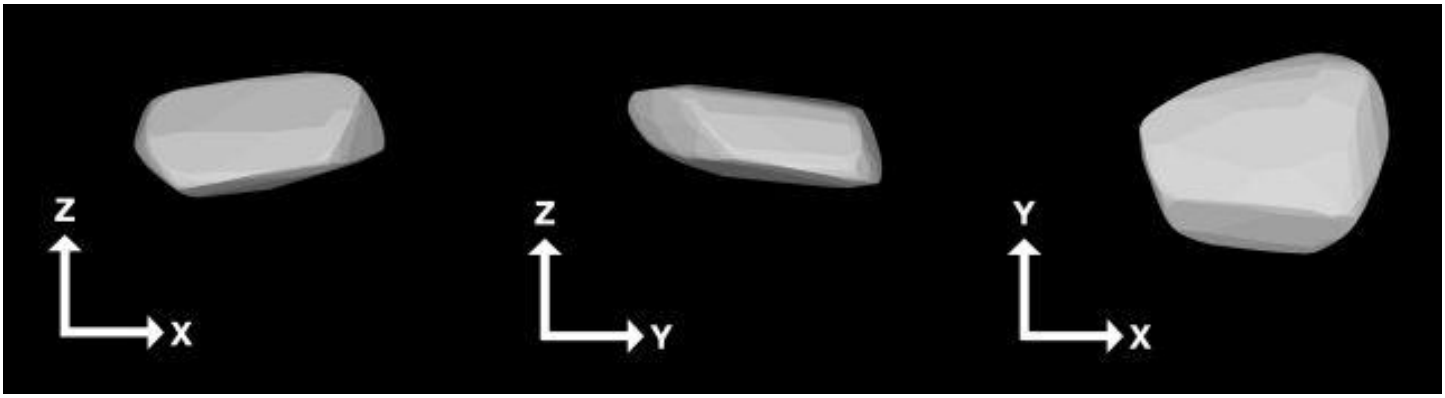
https://www.projectpluto.com/temp/yr4/moon.png

https://science.nasa.gov/blogs/planetary-defense/2025/04/02/nasa-update-on-the-size-estimate-and-lunar-impact-probability-of-asteroid-2024-yr4

Asteroid 2024 YR4 Update (Continued):

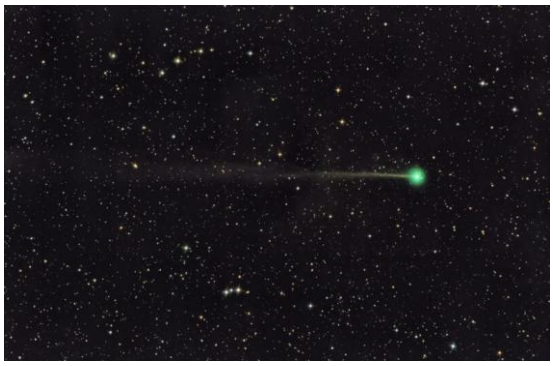
Using several large telescopes, astronomers have determined the rotation period (19.46 minutes) and have obtained a lightcurve from which they have created a shape model for the 60-meter-diameter asteroid 2024 YR4. Based on these and other observations such as JWST, 2024 YR4 is rocky, similar to S-type asteroids. The article says that it is a surprise as to the possible origin in the middle of the asteroid belt, but this is the location of one of the Kirkwood gaps, where many NEOs originate. Objects at this distance orbit three times for each orbit of Jupiter, so their eccentricities are pumped up, similar to pushing someone on a swing to make them go higher. Also, it appears that 2024 YR4 is a solid rock. If it were a rubble pile, it would have flown apart. Also, there are rubble pile S-type asteroids, such as 25143 Itokawa, so being a rubble pile is not unique to C-type asteroids.

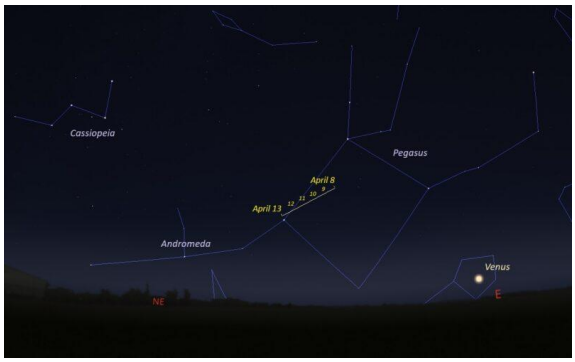
https://www.sciencealert.com/city-killer-asteroids-origin-traced-to-an-unexpected-part-of-the-solar-system



Shape model of 2024 YR4 compiled from photometry of the asteroid from the Minor Planet Center archive, the VLT archive, and the Gemini South telescope. (Bolin et al., arXiv, 2024)

A New Comet:





A recently-discovered comet is visible with binoculars in the morning sky. A star chart for it is on the far right and an image taken by Satoru Murata, I think in New Mexico. Two amateur astronomers, independently discovered what is now called C/2025 F2 (SWAN) examining images taken by the SWAN instrument on the ESA's SOHO spacecraft. The comet will be closest to the Sun, just inside the orbit of Mercury, on May 1 which is also the same day it will be closest to Earth. At that time, it will be low to the East just before sunset in the evening, but will be at magnitude 4 or 4.5, making it hard to see even with binoculars. I will keep you updated if it brightens.

https://www.space.com/new-comet-swan25f-photo-josh-dury-uk-skies

https://earthsky.org/space/new-comet-swan25f-april-2025-how-to-see-it/

Some Pictures

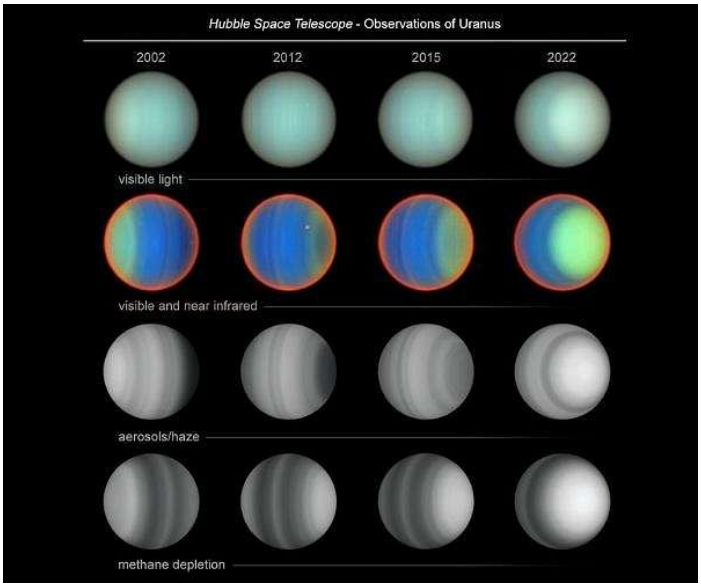
This year was the 70th anniversary of the SARSEF Regional Science and Engineering Fair. I have judged for over 20 years. I have collaborated the Vatican Observatory and Vatican Observatory Foundation to give out 5 or 6 awards each year to worthy students. They get meteorites and a booklet about meteorites. After a several year gap, the Planetary Science Institute is again providing a meteorite award. This year, the PSI award went to Grade 8 student Kent Olsson. His project was "Airfoil Designs for Flying \Crafts on Titan." The Vatican Observatory awards went to Grade 1 student Maxwell Judd, " Don't Burst My Bubble;" Grade 6 student Ethan Gamez Carreno, "Power From the Ground Up, Comparing Electric Generation from Mud and Sand Bacteria;" and High School students Hernando Solis, Pablo Sosa, and Alondra Arellano, "The Effects of Light Pollution on Astronomy Students."

Astronomy in the News

NASA, ESA, and Other Missions:

HST Observations of Uranus:

It takes Uranus 84 years to orbit the Sun. It is also tilted on its side, tilted 98 degrees from the plane of its orbit around the Sun, so its seasons are extreme relative to seasons on Earth (Earth is tilted 23.5 degrees). Astronomers have used HST to monitor the atmosphere of Uranus from 2002 to 2022 as the north polar region has gone from Spring toward Summer. In 2030, the north pole of Uranus will be pointed toward the Sun. The astronomers have found that the polar regions of Uranus are depleted in methane relative to the equatorial regions. They have also seen an increase in atmospheric haze in the north polar region as it receives more solar illumination. Astronomers can use Uranus as a model for the atmospheres of similar exoplanets.



At the same time, another group of astronomers have monitored Uranus' auroras as a way to study Uranus' magnetic poles and use this information to determine the rotation rate of Uranus. They have derived a period of 17 hours, 14 min, and 52 seconds, 28 seconds longer than the original estimate by Voyager 2.

https://www.stsci.edu/contents/news-releases/2025/news-2025-011.html

https://www.spacedaily.com/reports/20_years_of_Hubble_data_reveals_evolving_weather_patterns_on_Uranus_999.html

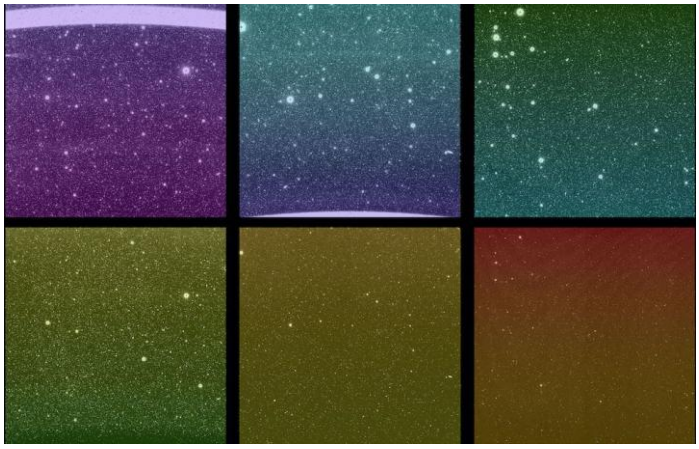
https://www.space.com/the-universe/uranus/a-day-on-uranus-is-actually-longer-than-we-thought-hubble-telescope-reveals

SPHEREx First Images:

On March 11, NASA launched two new spacecraft into Earth orbit. **PUNCH** (Polarimeter to Unify the Corona and Heliosphere) is designed to study the Sun with four small independent satellites with a separate instrument on each. As of the first week of April, there have been no images or data released as they are still in the early stages of testing and calibration. "PUNCH is a NASA Small Explorer (SMEX) mission to better understand how the mass and energy of the Sun's corona become the solar wind that fills the Solar System. Four suitcase-sized satellites will work together to produce images of the entire inner Solar System around the clock."

The objectives of the mission are:

- Objective 1. Understand how coronal structures become the ambient solar wind.
- Objective 2. Understand the evolution of transient structures (such as CMEs) in the young solar wind



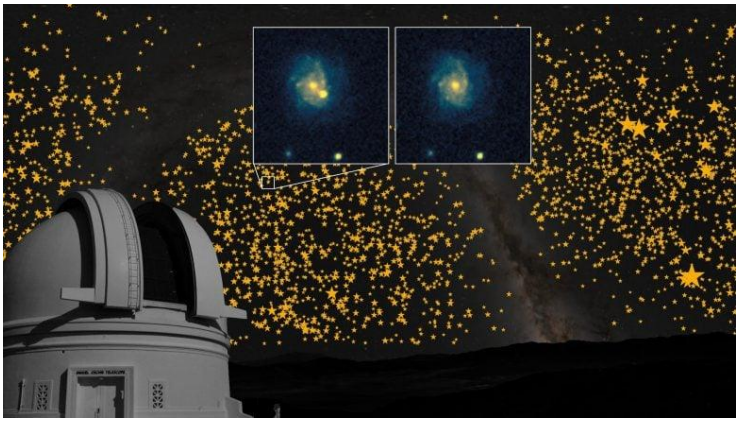
NASA's SPHEREx, which will map millions of galaxies across the entire sky, captured one of its first exposures March 27. The observatory's six detectors each captured one of these uncalibrated images, to which visible-light colors have been added to represent infrared wavelengths. SPHEREx's complete field of view spans the top three images; the same area of the sky is also captured in the bottom three images [different wavelength?] (Credit : NASA/JPL-Caltech)

The **SPHEREx** (The Spectro-Photometer for the History of the Universe, Epoch of Reionization, and Ices Explorer) mission will provide an all-sky spectral survey in the near-infrared (0.75 to 5 microns). It will classify galaxies according to redshift, categorizing about 450 million galaxies at 102 wavelengths. It will survey the entire sky four times during the mission. Its first data release is shown in the images above. The first images cover a 3.5-degree by 11-degree field of view at different wavelengths.

https://www.universetoday.com/articles/here-are-spherexs-first-images

Zwicky, Diversity in Type 1a Supernova:

The Zwicky Transient Telescope on Palomar Mountain in southern California has been used to survey the sky. The research paper discussed in the article linked below report observations of nearly 4,000 Type 1a supernovae. These explosions occur when a white dwarf accumulates enough new material in order to reignite fusion. It has been assumed that there is a critical point when this occurs and that they all reach a similar brightness peak, implying that they can be used as a method of determining distances to the galaxies in which they are seen. The results of this research appears to contradict this. They report that there appear to be multiple ways for white dwarfs to explode: accreting material from a binary companion, the merging of a white dwarf and its companion, and the collision of two white dwarfs. If this is correct, it brings into question the use of these supernovae as distance-determining candles.

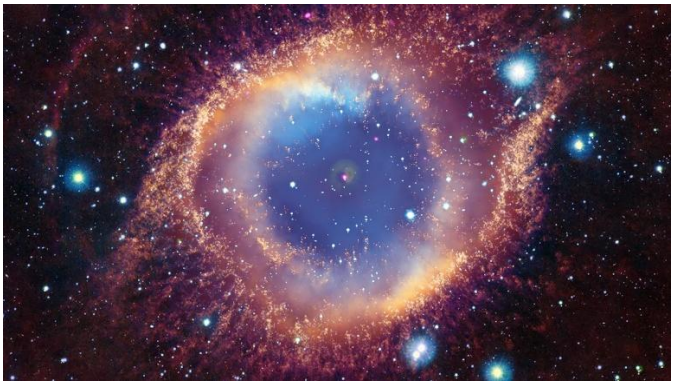


The Palomar 48-inch telescope at the Palomar Observatory in California with an image of the Milky Way in the background. The stars represent the number of supernovae discovered in each direction and the inset is an image of a galaxy after (left) and before (right) the supernova exploded. Credit: Mickael Rigault

https://scitechdaily.com/4000-supernovae-may-change-everything-we-know-about-dark-energy/

Chandra, Helix Nebula:

The Helix Nebula is a planetary nebula (when barely resolved, it looks like a planet) that is about 650 light-years from us and is about 5.7 light-years in diameter. A planetary nebula is formed when an intermediate-sized star (like our Sun) sheds its outer layers near the end of its life. The central remnant "star" is a white dwarf. It is no longer fusing atoms, but glows from its remnant heat. It is the radiant energy of the central star that illuminates the expelled gases. The authors report on observations that combine X-rays (this new research, Chandra X-ray Observatory), ultraviolet light (NASA's Galaxy Evolution Explorer space telescope), visible light (HST), and infrared light (ESO's Visible and Infrared Telescope for Astronomy. The authors report the detection of the central white dwarf and have been able to explain unusual X-ray emissions that have been previously detected—the white dwarf is in the process of consuming a small non-stellar companion, either a brown dwarf or an exoplanet.



The Helix Nebula, also known as Caldwell 63, is 650 light-years from Earth. (Image credit: NASA/CXC/SAO/Univ Mexico/S. Estrada-Dorado et al.; Ultraviolet: NASA/JPL; Optical: NASA/ESA/STScI (M. Meixner)/NRAO (T.A. Rector); Infrared: ESO/VISTA/J. Emerson; Image Processing: NASA/CXC/SAO/K. Arcand)

https://www.livescience.com/space/astronomy/jaw-dropping-nasa-image-reveals-a-dying-star-at-the-heart-of-the-helix-nebula-and-it-may-have-just-murdered-a-planet

April Night Sky

Sky Stories:

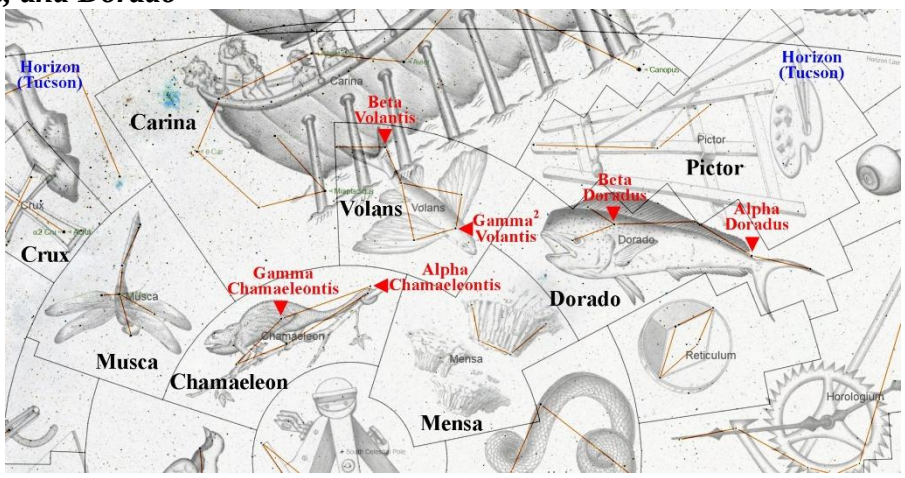
Southern Constellations:

There are about 16 southern constellations that are not visible from the continental US, depending on how far south you are.

Petrus Plancius was an astronomer, cartographer, and clergyman. He lived from 1552 to 1622. He is best known for his map of the known world that was published in 1592. In 1589, he and Jacob van Langren created a 32.5-cm celestial globe. On it were only four southern constellations/asterisms: Crux (the Southern Cross), Triangulum Australia (the Southern Triangle), and the Magellanic Clouds (Nubecula Major and Minor). Recognizing this Plancius commissioned (and trained) the chief pilot Pieter Keyser, assisted by navigator Frederick de Houtman) on an expedition that was sailing to the Dutch East Indies (Keyser unfortunately died in Java) to map the southern skies and fill in the gaps during the voyage. Fortunately, the map survived and contained 135 stars. In 1597 or 1598, Plancius, in collaboration with cartographer Jodocus Hondius, created a new celestial globe that included these stars as 12 new constellations (animals and subjects described in history books): Apis (the Bee, later changed to Musca [the Fly] by Lacaille), Apus (the Bird of Paradise), Chamaeleon (the Chameleon), Dorado (the Goldfish or Swordfish), Grus (the Crane), Hydrus (the Small Water Snake), Indus (the Indian), Pavo (the Peacock), Phoenix (the Pheonix), Triangulum Australe (the Southern Triangle), Tucana (the Toucan), and Volans (the Flying Fish). The Southern Triangle and the Southern Cross (Crux) were on previous maps as asterisms, but the globe of 1598 is the first surviving source that plots their locations reasonably accurately. The stars of the Southern Cross were known to the ancient Greeks, but Ptolemy included the stars of the Southern Cross as part of the constellation Centaurus. As I have mentioned before, because of polar precession, several constellations, including Centaurus were above the horizon as seen by the Greeks, but disappeared below the horizon in most of Europe by about the Fourth Century. Emery Molyneux and Petrus Plancius are considered the first sky mappers to distinguish Crux as a separate constellation. Its stars were first catalogued separately from Centaurus by Frederick de Houtman in 1603. The constellation was later adopted by Jakob Bartsch in 1624 and Augustin Royer in 1679. The four other southern constellations are Circinus (the Drafting Compass), Nicolas-Louis de Lacaille, 1756; Mensa (the Table), Lacaille; Octans (the Octant, a navigational instrument), 1752; and Reticulum (the Reticle), Lacaille.

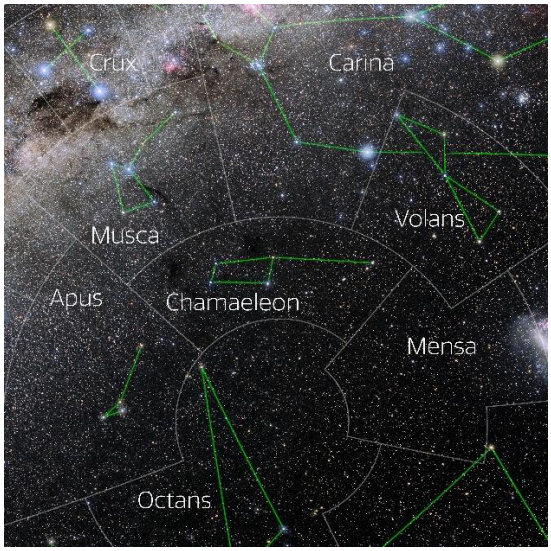
Featured Constellations: Chamaeleon, Volans, and Dorado

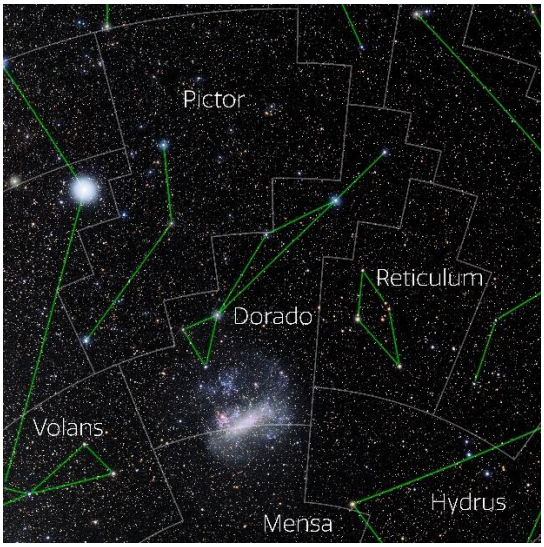
Our featured constellations this month are Chamelaeon, the Chameleon; Volans, the Flying Fish; and Dorado, the Goldfish or Swordfish. The Starry Night image on the right shows the usual stick figures. I have included an illustration of these constellations and a few surrounding ones. You will notice in the image that I have removed the horizon so that you can see these constellations which are below my horizon (and anyone farther north).



Looking South at about 9:00 p.m. (DST) on April 15

These are all faint constellations. Chamaeleon has six stars between magnitudes 4.0 and 4.99 and an additional 13 stars between magnitudes 5.0 and 5.99. Volans has four stars between magnitudes 3.0 and 3.99, two stars between magnitudes 4.0 and 4.99, and an additional 13 stars between magnitudes 5.0 and 5.99. Dorado has two stars between magnitudes 3.0 and 3.99, five stars between magnitudes 4.0 and 4.99, and an additional 11 stars between magnitudes 5.0 and 5.99. Chamaeleon has nine known (both confirmed and candidate) exoplanets orbiting nine stars. Volans has 12 known (both confirmed and candidate) exoplanets orbiting 8 stars. Dorado has 20 known (both confirmed and candidate) exoplanets orbiting 8 stars.





Photos of the constellations Chamaeleon, Volans, and Dorado with annotations from IAU and Sky & Telescope. Credit: E. Slawik/ NOIRLab/NSF/AURA/M. Zamani

Each constellation has at least one interesting star and planetary system.

- Chamaeleon: **COCONUTS-2** (35 light-years from us) is a red dwarf with one exoplanet (or very small brown dwarf). COCONUTS-2A (COol Companions ON Ultrawide orbiTS) is a red dwarf star that is 35 light-years from the us. The star is estimated to be between 150 and 800 million years old. The star is formally known as L 34-26 and may be a part of the Ursa Major Moving Group and is therefore related to many of the stars in the Big Dipper. In 2011 a free-floating small dwarf object (or a free-floating sub-brown dwarf) was discovered. In 2021, the COCONUTS survey discovered that this object was associated with L 34-26 and that, with a mass of only eight times that of Jupiter, it was orbiting the star at a distance of 7,500 AU and with an orbital period of 1.1 million years (both with large uncertainties). It is not clear how the exoplanet, COCONUTS-2b, formed, either captured or formed closer in and pulled to a more distant orbit by a passing star. At 430 K (310° F), it is classified as a T9.5 brown dwarf. This is close to the lowest temperature found for a brown dwarf, but it is also consistent with a large exoplanet that is still contracting after formation.
- Volans: **WD 0806-661** is a white dwarf, an evolved solar-mass star. It is orbited by a substellar object, WD 0806-661b, which has a mass that is about eight times that of Jupiter and orbits about 2,500 AU from the host star. It has a temperature of about 350 K (170° F), classified as a Y1 brown dwarf, so it is at lower

temperature than COCONUTS 2b. Both of these exoplanets are considered either large exoplanets or small, very cool brown dwarfs. Being below the mass needed for fusion, they are considered exoplanets, however, as with the "discussion" as to what is a planet (is Pluto a planet?), there are astronomers who consider these to be brown dwarfs because of how they are thought to have been formed. **L 98-59 [TOI-175]** (35 light-years from us) is a red dwarf with five exoplanets. All orbit within 0.1 AU of the host star, so with about one quarter of the distance of Mercury from the Sun. They have masses that range from 0.4 to 3 times that of the Earth.

- Dorado: **GJ 163** (49 light-years from us) is a red dwarf with five exoplanets. All five have masses between the masses of Earth and Neptune and all orbit at distances from the host star within 1 AU of the host star. **TOI-700** (100 light-years from us) is a red dwarf with four exoplanets that orbit the host star at distances less than half that of Mercury. The closest exoplanet to the host star is smaller than the Earth. The other three of the exoplanets are Earth-sized or a little larger and the farthest one out may be in the star's habitable zone.

The brightest star in Chamaeleon is Alpha Chamaeleontis at magnitude 4.06. Alpha is an F5 V (yellow-white) Main Sequence star. Alpha has a surface temperature (visible surface) of 6,600 K. It is about 7.5 times as luminous as the Sun with a mass that is about 1.4 times that of the Sun and a diameter that is about 2.1 times that of the Sun. Alpha is about 64 light-years from us. It is estimated to be 1.8 billion years old. Based on its motion relative to the Sun, in 670,000 years, it will come within about 47 light-years of us. The brightest star in Volans is Gamma^2 Volanis at magnitude 3.6. Gamma^2 is a K0 III (orange) giant star that has evolved off the Main Sequence. Gamma^2 has a surface temperature (visible surface) of 4,900 K. It is about 54 times as luminous as the Sun with a mass that is about 2.2 times that of the Sun and a diameter that is about 10 times that of the Sun. Gamma^2 is about 130 light-years from us. It is estimated to be 1.4 billion years old. Gamma Volanis is a wide binary. The companion to Gamma^2 is Gamma^1 Volanis, a K-type (orange) Main Sequence star at magnitude 5.7, 14 arcseconds away from Gamma^2. The brightest star in Dorado is Alpha Doradus, a binary star system with a combined magnitude that varies from magnitude 3.26 to 3.30 with a period of 2.9 days. Alpha Doradus B revolves around Alpha Doradus A with a period of 12 years in an eccentric orbit that varies from 2 AU to 17.5 AU. This translates to a mean apparent separation of 0.2 arcseconds. Alpha Doradus B is about a magnitude fainter that Alpha Doradus A. Alpha Doradus A is an A0 III (white) giant star that evolved off the Main Sequence. Alpha Doradus A has a surface temperature of 11,600 K. It is about 200 times as luminous as the Sun with a mass that is about 3.3 times that of the Sun and a diameter that is about 3.5 times that of the Sun. Alpha Doradus B is a B9 (blue-white) subgiant that has evolved off the Main Sequence. Alpha Doradus B has a surface temperature (visible surface) of 12,200 K. It is about 70 times as luminous as the Sun with a mass that is about 2.7 times that of the Sun and a diameter that is about 1.9 times that of the Sun. Alpha Doradus is about 170 light-years from us. The binary star system is estimated to be 200 million years old.

Telescope, Binocular, and Camera Targets:

This is our last chance to see Jupiter. The Pleiades and the Orion Nebula are nice evening objects, but, by the end of April, they will be very low after the sky gets dark and will soon be lost in the evening twilight. Mars, though fading, is still a nice evening object. Mercury, Venus, and Saturn are now morning objects. The middle of April is a good time to see all three planets in the morning sky. The Moon joins the around April 25. I have already mentioned the Lyrid meteor shower the morning of April 22 and the possibility of seeing a comet in the evening sky.

Moon and Planets:

First Quarter Moon was on April 4. April's Full Moon, the Pink Moon, is on April 12. Last Quarter Moon is on April 20. There is another New Moon on April 27.

> *From Timeanddate.com:*
> "The Full Moon in April is named the Pink Moon after the pink flowers that bloom in spring. Other names are Breaking Ice Moon, Budding Moon, Awakening Moon, Egg Moon, and Paschal Moon.

"The Pink Moon in April gets its name from pink wildflowers that bloom in the early spring. It is thought that the name comes from the brightly-colored pink phlox wildflowers that are native to North America and that often bloom around the time of April's Full Moon.

"The Native American names refer to the spring thaw and the signs of new growth each year—including names like the Breaking Ice Moon and The Moon of the Red Grass Appearing.

"Common names in Europe also refer to the budding and birth of spring: with grass sprouting, birds laying eggs, and people planting seeds. The Celts had names like Budding Moon, New Shoots Moon, Seed Moon, and Growing Moon. A Neo-Pagan name is Awakening Moon.

"The Anglo-Saxons called it Egg Moon, which is often referenced as a possible reason for the emergence of the modern Easter Bunny laying Easter eggs."

"The Paschal Moon is the first Full Moon on or after March 21 and is used to determine the date of Easter. In some years, the Paschal Moon is the Pink Moon [as it is this year]; in others, it's the Worm Moon (Full Moon in March). The dates for the Paschal Moon range from March 21 to April 18."

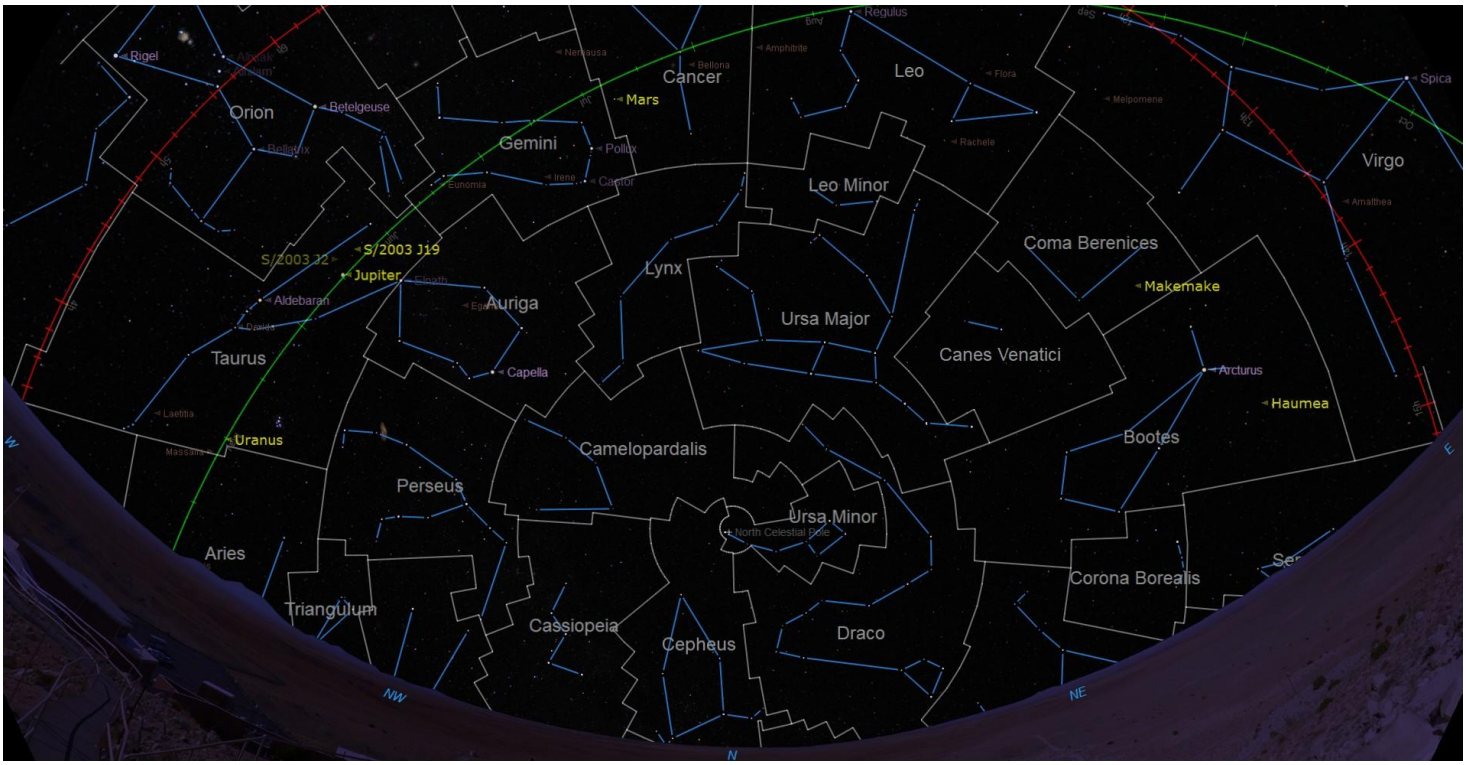
This year, Easter is on April 20.

From Space.com:
"The grass pink or wild ground phlox is one of the earliest widespread flowers of the spring. Other names were the Full Sprouting Grass Moon, the Egg Moon, and —among coastal tribes — the Full Fish Moon, when the shad [American shad is a migratory fish native to the Atlantic coast] came upstream to spawn. This is also the first full moon of spring — the so-called Paschal Moon."

The Moon was at perigee (357,115 km [221,901 miles] from Earth) on April 27. The Moon is at apogee (406,295 km [252,460 miles] from the Earth) on April 13.

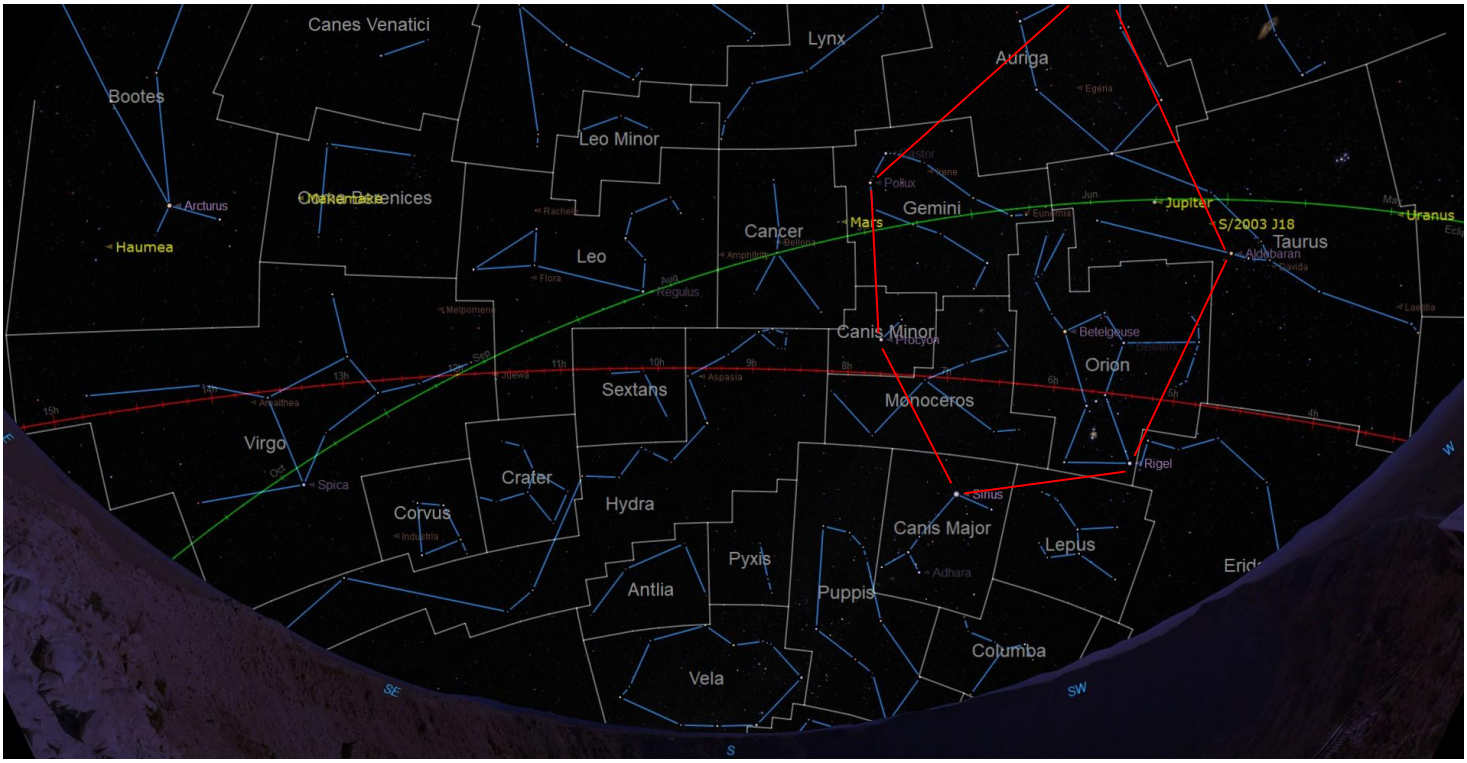
On April 1, the waxing crescent Moon passed 5 degrees north of Uranus at 10:00 a.m. (EDT). On April 2, the waxing crescent Moon passed 6 degrees north of Jupiter at 8:00 p.m. On April 5, the waxing gibbous Moon passed 6 degrees north of Mars at 3:00 p.m. On April 24, the waning crescent Moon passes 2 degrees south of Venus at 9:00 p.m. (three days before New Moon). Three hours later, the waning crescent Moon passes 2 degrees north of Saturn. On April 25, the waning crescent Moon passes 2 degrees north of Neptune at 6:00 a.m. That evening the waning crescent Moon passes 4 degrees north of Mercury at 9:00 p.m. On April 28, the one-day-old waxing crescent Moon passes 5 degrees north of Uranus at 10:00 p.m. On April 30, the waxing crescent Moon passes 5 degrees north of Jupiter at 2:00 p.m. Note that this is the second time that the Moon has passed by both Uranus and Jupiter.

Early Evening Sky Viewing:
All times in this paragraph are for Tucson (Standard Time), so, since the rest of the country is now on Daylight Saving Time, we are now in the same zone as California. Any other differences will be related only to your latitude and location in your time zone. In Tucson, on the evening of April 15, 2025, sunset is at 6:54 p.m. (23 minutes later than on March 15), Civil Twilight is at 7:20 p.m. (24 minutes later), Nautical Twilight is at 7:50 p.m. (26 minutes later), and Astronomical Twilight is at 8:21 p.m. (27 minutes later). You may see a few of the brightest stars and planets after Civil Twilight. You start seeing fainter stars and planets by around Nautical Twilight and the sky is darkest by Astronomical Twilight. The length of the day in Tucson is 12 hours and 59 minutes on April 15 (60 minutes longer than on March 15). **Times will also vary depending on where you are in your time zone and your latitude. In New York, sunset is at 7:35 p.m. on April 15 (32 minutes later than on March 15). The length of the day in New York is 13 hours 18 minutes on April 15 (82 minutes longer than on March 15).**



April 15, 2025, looking North at 9:00 p.m. (DST, 8:00 MST and HST). The + marks the Zenith (overhead). This is after Nautical Twilight, so the sky is fairly dark. The red line is the celestial equator, the projection of Earth's equator onto the sky and the green line is the ecliptic, the path of the Sun through the sky.

Looking North at about 9:00 p.m. (DST, 8:00 p.m. in Arizona and Hawaii) in mid-April, many of the constellations that were low in the West last month have set or are setting as the constellations and their stars rise earlier/set earlier. The Sun is setting later (and rising earlier), so the nights are getting shorter. Setting in the northwest are Triangulum (the Triangle), and Aries (the Ram). Low in the northwest is Cassiopea (the Queen). A little higher in the west are Perseus (the Hero), Taurus (the Bull), and Orion (the Hunter). Jupiter and Uranus are in Taurus. Cepheus (the King) is below Polaris and may not be visible if you do not have a clear northern horizon. West of Polaris are Camelopardalis (the Giraffe), Auriga (the Charioteer), and Gemini (the Twins). Cancer (the Crab) is due North, along with Mars. Just past due North is Lynx (the Lynx). Just east of Polaris are Draco (the Dragon), Ursa Minor (the Little Bear), Ursa Major (the Great Bear), on his back. Above Ursa Major are Leo Minor (the Lessor Lion) and Leo (the Lion). East of Draco and Ursa Major are Boötes (the Herdsman), Canis Venatici (the Hunting Dogs), and Coma Berenices (the Berenice's Hair). Just rising in the northeast is Corona Borealis (the Northern Crown). Just rising in east is Virgo (the Maiden).

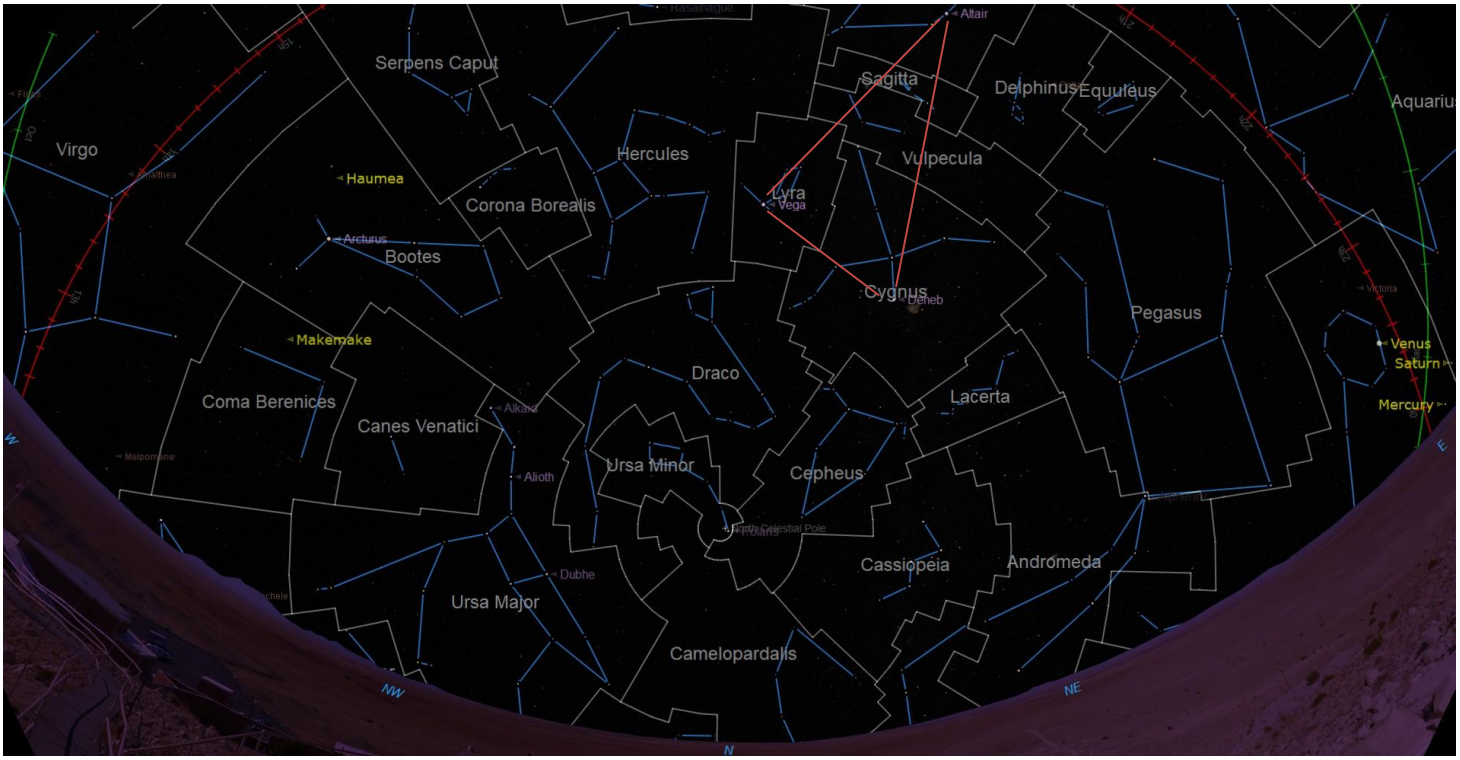


April 15, 2025, looking South at 9:00 p.m. (DST). The + marks the Zenith (overhead).

Describing constellations not discussed above, looking South, at 9:00 p.m., by mid-April, we can see, setting in the west, the last part of Eridanus (the River). Also setting is Columba (the Dove). Between Orion and Columba is Lepus (the Hare). Low in the North are Puppis (the Poop Deck), Vela (the Sails), Pyxis (the Compass), and Antlia (the Pump). East (left) of Lepus are Canis Major (the Greater Dog). Above Canis Major are Monoceros (the Unicorn), and Canis Minor (the Lesser Dog). Just east of due South is Sextans (the Sextant). Below and to the east of Sextans are Crater (the Crater) and Corvus (the Crow). I have included the star that make up the asterism, the Winter Hexagon: Rigel (Orion), Aldebaran (Taurus), off the image, Capella (Auriga), Pollux (Gemini), Procyon (Canis Minor), and Sirius (Canis Major).

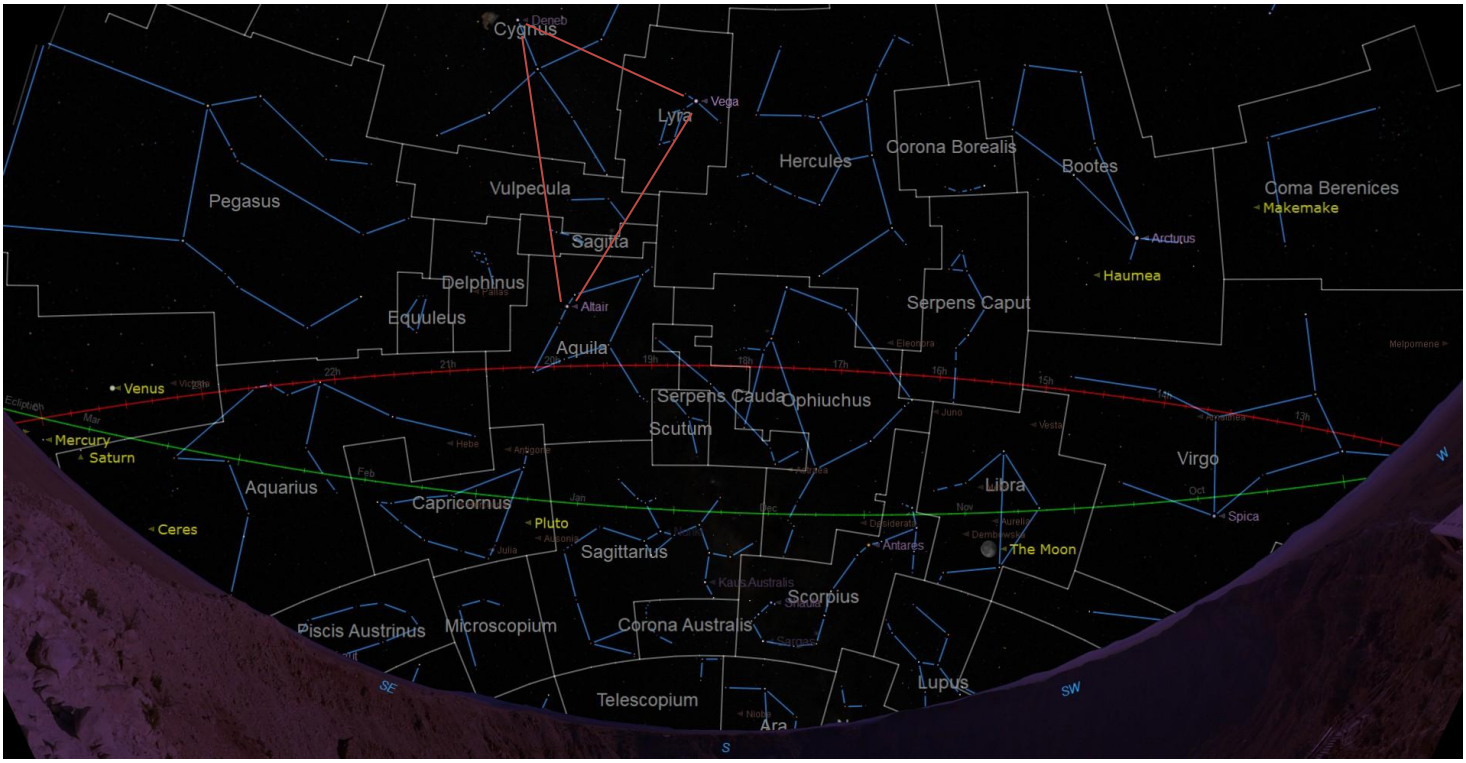
Early Morning Sky Viewing:

All times in this paragraph are for Tucson (Standard Time), so, since the rest of the country is now on Daylight Saving Time, we are now in the same zone as California. Any other differences will be related only to your latitude and location in your time zone. In Tucson, on April 15, in the morning, Astronomical Twilight is at 4:28 a.m. (43 minutes earlier than on March 15), Nautical Twilight is at 4:59 a.m. (41 minutes earlier), Civil Twilight is at 5:29 a.m. (39 minutes earlier), and sunrise is at 5:54 a.m. (39 minutes earlier). You start losing your fainter stars by around Nautical Twilight and lose all but the very brightest stars and planets before Civil Twilight. Times will also vary depending on where you are in your time zone and your latitude. Times will also vary depending on where you are in your time zone and your latitude. **Times will also vary depending on where you are in your time zone and your latitude. In New York, sunrise is at 6:16 a.m. on April 15 (51 minutes earlier than on March 15).**



April 15, 2025, looking North at 6:00 a.m. (DST). The + marks the Zenith (overhead). This is very close to Nautical, so the sky is still fairly dark.

Looking North at 6:00 a.m. (DST, 5:00 a.m. in Arizona and Hawaii) in mid-April, the constellations that are just rising in the evening are the ones that are setting in the west and northwest before dawn. The constellations that are in the east before dawn were evening constellations one or two months ago (if they are not circumpolar). Virgo (the Maiden) is setting in the west. Camelopardalis (the Giraffe) is low in the north. It is a circumpolar constellation, so the farther north you are, the more of it that you can see in the morning. For those of us in the southern part of the US, Ursa Major (the Great Bear) is partly below the horizon and is almost on his feet. Higher in the northwest/west are Canes Venatici (the Hunting Dogs), and Coma Berenices (the Hair of Berenice). East of these and just west of north are Boötes (the Herdsman), and Corona Borealis (the Northern Crown). East of these and just west of north are Boötes (the Herdsman) and Corona Borealis (the Northern Crown). Just west of due North are Ursa Minor (the Little Bear), Draco (the Dragon), and Hercules (the Hero). Above these is most of Serpens Caput (the Serpent Head). Just to the east of due North are Lyra (the Lyre), part of Aquila (the Eagle), and Cygnus (the Swan)—the Summer Triangle. Sagitta (the Arrow) and Vulpecula (the Little Fox) share the sky with the constellations of the Summer Triangle. To the east of Sagitta are Delphinus (the Dolphin) and Equuleus (the Little Horse). Below Cygnus are Cepheus (the King), Cassiopeia (the Queen), and Lacerta (the Lizard). Lower in the east are Pegasus (the Flying Horse) and Andromeda (the daughter of Cassiopeia). Partly visible on the eastern horizon is the rising Pisces (the Fishes), along with Venus, Mercury, and Saturn.



April 15, 2025 looking South at 6:00 a.m. (DST). The + marks the Zenith (overhead).

Looking South in mid-April at 6:00 a.m., for the constellations that are not mentioned looking North. In the south, low on the horizon, so they may not be visible for those in the northern US, are Lupus (the Wolf), Norma (the Carpenter's Square), Ara (the Alter), and Telescopium (the Telescope). Above these, from west to east are Libra (the Scales), Scorpius (the Scorpion), Sagittarius (the Archer), and Capricornus (the Horned Goat), and, rising in the southeast, Piscis Austrinus (the Southern Fishes). Ophiuchus (the Serpent-Bearer) is just east of south. Ophiuchus (the Serpent-Bearer) is just west of south. On either side of him are Serpens Caput (the Head of the Serpent, mentioned above) and Serpens Cauda (the Tail of the Serpent). The rest of Aquila (the Eagle) is now visible. Aquarius (the water bearer) is now mostly above the horizon. You get another view of Saturn (actually in Aquarius and moving into Pisces) Mercury, and Venus in Pisces.

Where are the Planets?

Mercury is a morning object in April. Mercury is in Pisces all month. It starts off the month at magnitude 2.0. Mercury is at greatest western elongation on April 21, at magnitude 0.4, and brightens to magnitude 0.1 at the end of April. As I mentioned above, the middle of April is a good time to see Mercury, Venus, and Saturn.

Venus is now a morning object and visible in the morning sky all month. Venus started the month at magnitude -4.2 and brightens to magnitude -4.5 on April 15 and is still at magnitude -4.5 at the end of the month. Venus is in Pisces all month. Note that Astronomy magazine has Venus about 0.3 magnitudes brighter than Starry Night. I do not know what the difference is, but, in any case, Venus is the brightest object in the sky other than the Moon and the Sun.

Mars is in our evening/night sky all month, still setting well after midnight by the end of April. Mars starts out the month in Gemini and moves into Cancer on April 12. Mars starts out the month at magnitude 0.5 and fades to magnitude 0.9 by the end of the month.

Jupiter is in Taurus all month. April and May will be the last we see of Jupiter in the evening sky. Taking this from Astronomy magazine (since I am still on Standard Time), Jupiter starts out April 45 degrees above the horizon an hour after sunset and sets after midnight. By the end of April, it is only 25 degrees above the horizon an hour after sunset and sets an hour before midnight. Jupiter starts March at magnitude of -2.1 and fades to magnitude -2.0 by the end of the month.

Saturn is now a morning object. It starts out the month in Aquarius and moves into Pisces around April 21. Saturn is at magnitude 1.2 all month. By the end of April, it is rising nearly 2 hours before sunrise.

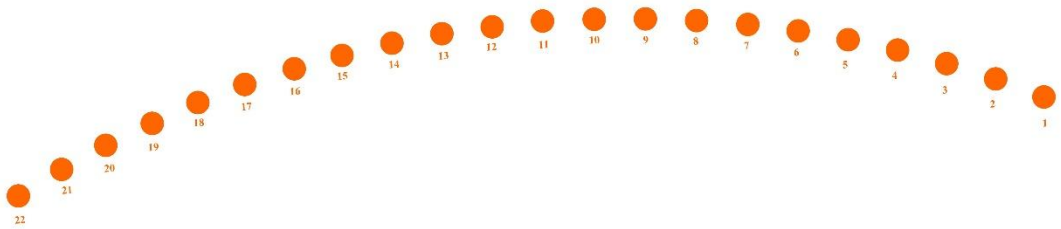
Uranus is in Taurus all month. Neptune remains at a magnitude of 5.8 all month. It moves into Taurus around March 3 and is there for the rest of the month. Uranus is a magnitude 5.8 all month. April is probably the last chance you will have of seeing Uranus as it gets closer to the Sun in the sky. By the end of April, it is setting a little over an hour after sunset.

Neptune is in Pisces all month. Neptune is at magnitude 7.9 all month. At the beginning of April, Neptune is too close to the rising Sun, but by the end of April it is rising 1.5 hours before the Sun rises.

Connecting with the Human Orrery

Using the Orrery, it is easy to model the positions of the planets relative to each other and to the Sun. Because the stars in the constellations are not at their true relative distances (many kilometers away in this model), the positions of the planets relative to the constellations may be "off" by more than a constellation. The first Orrery image below shows the planets out to Saturn. Jupiter and Saturn are at their correct relative distances. When printed out on 8.5 inch by 11inch paper (standard paper), the scale is about 1.5 cm = 1 AU, the Sun-Earth distance. The second Orrery has circles relevant for March only. I have given the relative positions for April 15, 2025. Printed out on standard paper gives a scale of 5 cm =1 AU. On the page-sized scale, Jupiter is 26 cm from the Sun's position and Saturn is 48 cm from the Sun's position. Because Jupiter and Saturn are "off the page," the lines from the Earth to Jupiter and Saturn go off the page toward their true relative positions. I should note that the Orrery is not perfect. It uses circular rather than elliptical orbits. For this reason, the relative positions of the planets may be off by a few days.

Using the Orrery, if you are on the Earth, as the Earth rotates in a counterclockwise direction, just after the Sun sets (over your right shoulder as you stand on the Earth), on April 15, **Jupiter** is visible low in the southwest. At the same time, Mars is high in the south. You need to continue to rotate until just before sunrise (the Sun over your left shoulder). It is only then that you can see Venus, Saturn, and Mercury a little before the Sun rises. This model does not include Uranus and Neptune (or Pluto), but with binoculars, two more planets are visible at this time.



1 7/15/23
2 10/3/23
3 12/22/23
4 3/11/24
5 5/30/24
6 8/18/24
7 11/6/24
8 1/25/25
9 4/15/25
10 7/4/25
11 9/22/25
12 12/11/25
13 3/1/26
14 5/20/26
15 8/8/26
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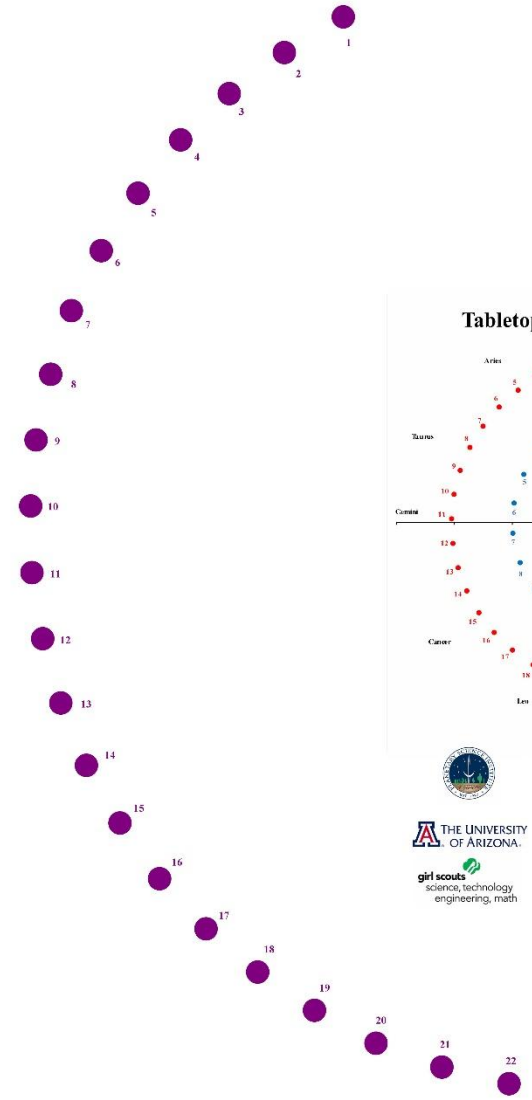
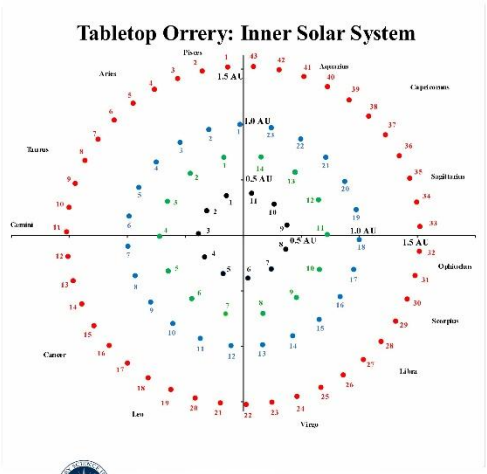
21 12/1/27
22 2/19/28





5 centimeters = 1 AU (Earth-Sun distance)
Step size: Mercury = 8 days
Venus, Earth, and Mars = 16 days
Jupiter and Saturn = 80 days

Mercury: 0.39 AU, orbital period = 88.0 days, 47.4 km/s
Venus: 0.72 AU, orbital period = 224.7 days, 35.0 km/s
Earth: 1.00 AU, orbital period =365.25 days, 29.8 km/s
Mars: 1.52 AU, orbital period = 687.0 days, 24.1 km/s
Jupiter: 5.2 AU, orbital period = 11.86 years, 13.1 km/s
Saturn: 9.6 AU, orbital period 29.46 years, 9.7 km/s

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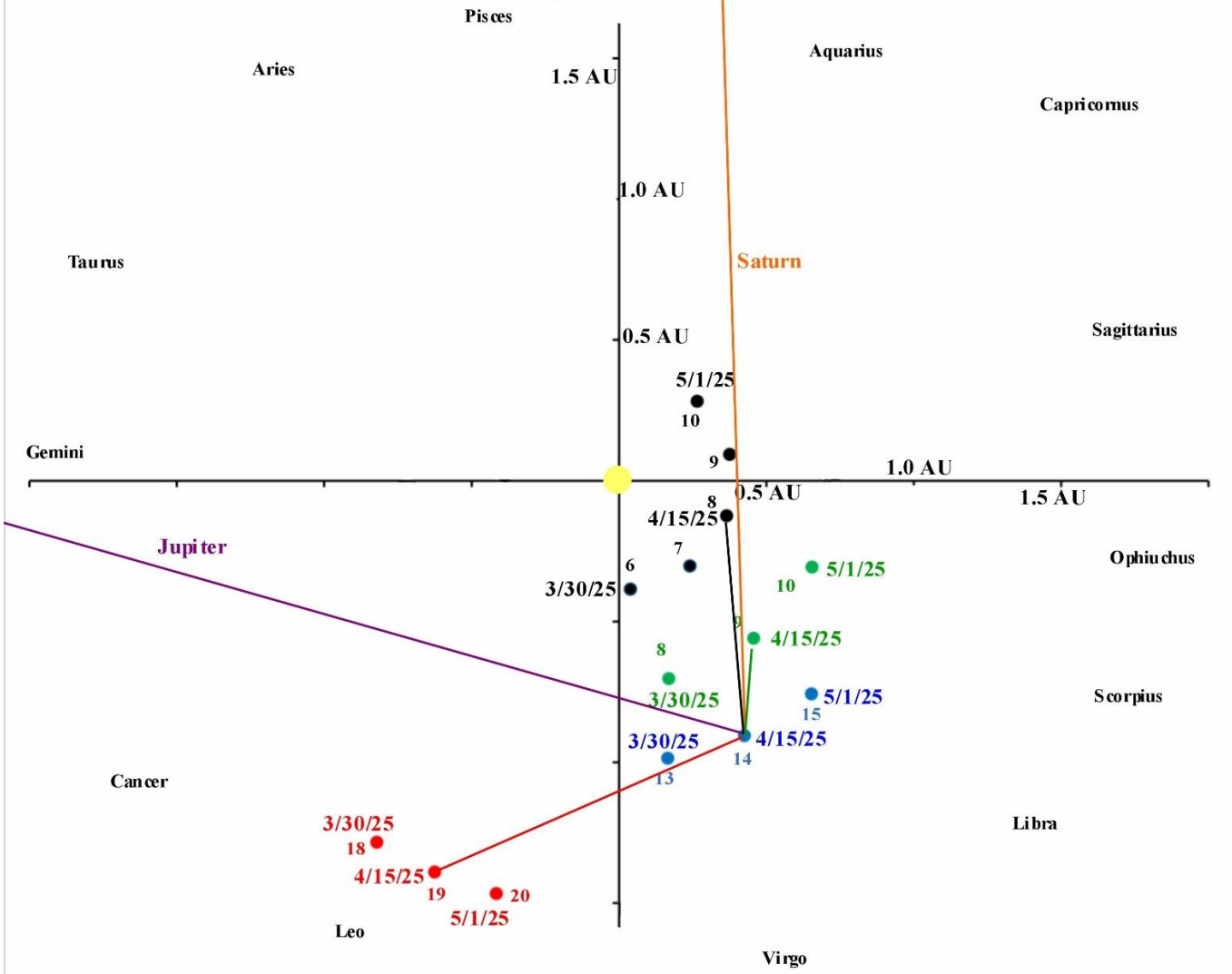
science, technology
engineering, math

Tabletop Orrery: Inner Solar System



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