Education & Public Outreach
June 2025, Part 1

June Special Events:

June Meteor Showers and other June Events:

There are no meteor showers this month, but we have seen a number of random meteors while under the stars on Mt. Lemmon.

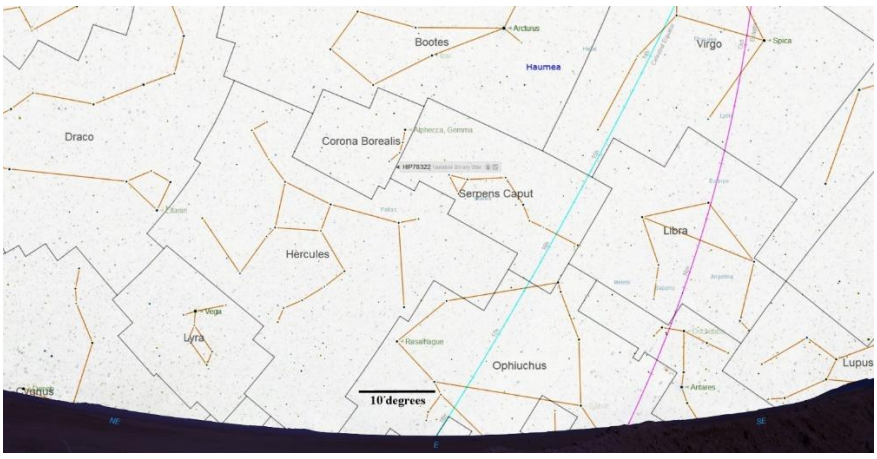
June 20 at 10:42 pm EDT marks the Summer Solstice, the official start of Summer. In Tucson, we have had a few 100-degree days starting this week (other than the one day in April). Unlike last year, we did not see any snow on Mt Lemmon, even in shaded areas (thanks, unfortunately, to the minimal rain we have had this year) as we drove to the summit for Adult Astronomy Camp. The short nights, as well as clouds, have affected our observing time on Mt. Lemmon. I have a few pictures below, including ones by our campers. We can observe from about Nautical Twilight in the evening until Nautical Twilight in the morning. As I write this, we are still on Mt. Lemmon and are limited to about eight hours of observing. We have seen a few bright meteors, not related to any meteor shower (none this month). Just after sunset on the first night, as we were getting ready to go to the 61-inch telescope, we were able to see Jupiter and our first constellation (not one of the 88 you are familiar with, as I will explain. I am now writing the rest of this the day after we left the mountain. We had one full clear night and two half nights. I am getting ready for the first of two trips to Mt. Graham. Unfortunately, I have just found out that the mountain is being evacuated—there is a small (about 10 acres) fire that is near the road, in rugged terrain, and 0% contained. We are scheduled to leave for the VATT on Saturday, so we are just hoping that (for us and for the trees) that the fire will soon be put out.

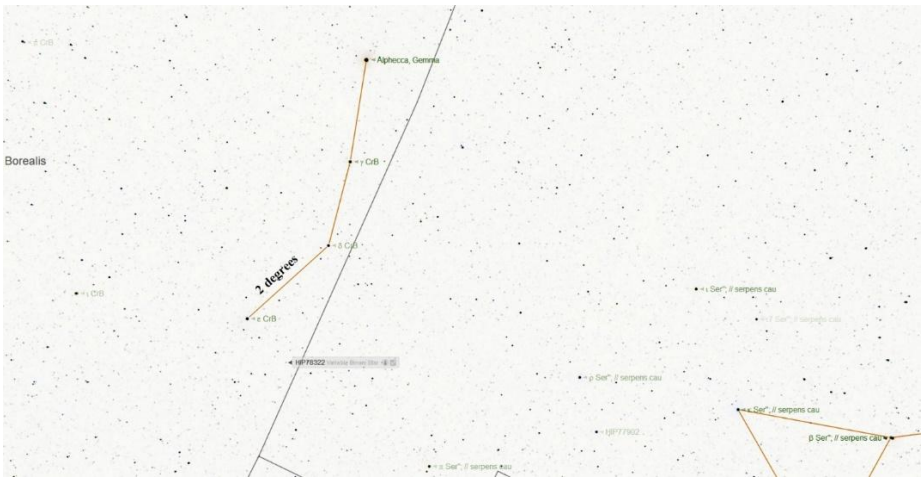
Upcoming Nova (Reposted):

It is now more than a year since the astronomers first predicted that T Corona Borealis would, as a recurring nova, "go nova" after the last event in 1946. In 2023 and 2024, there were five or six predictions (ranges of dates) for an upcoming brightening. Half of these have lapsed, but some of the predictions extend into 2026 and 2027. T Corona Borealis will likely brighten and be visible to the naked eye (it was seen in 1866 and 1946 and probably seen as far back as 1217) , it is only a matter of time, so astronomers keep monitoring it. I am repeating what I wrote a year ago as this is a good time for you to "look up." A 15-year-old schoolboy was the first to see it in 1946. Maybe you will be one of the first to see it! I will probably start monitoring it again.

There is nothing new to report. Many amateur and professional astronomers "out there" monitoring T Corona Borealis, waiting for the predicted nova (probably by September). The constellation is now ideally placed to observe both in the evening and the morning sky (though rising earlier in the evening and setting earlier in the morning). [last year]Tucson time, I have been taking images at around 9:00 at night and 4:00 in the morning (it is light by well before 5:00 a.m.). The catalog name of the double star is HIP78322. It is presently a little fainter than magnitude 10 but is predicted to brighten to somewhere between magnitude 2 and 3. The brightest star in Corona Borealis is Alphecca at magnitude 2.2. All other stars are between 3.5 and 4.5.

I am again including two finder charts I have made for evening viewing. These are for May 15 at 9:00 p.m. Tucson time, 10:00 elsewhere). I will update them in a month or two. The one below is a cropped version of the one on the right to show the location of the binary star system.

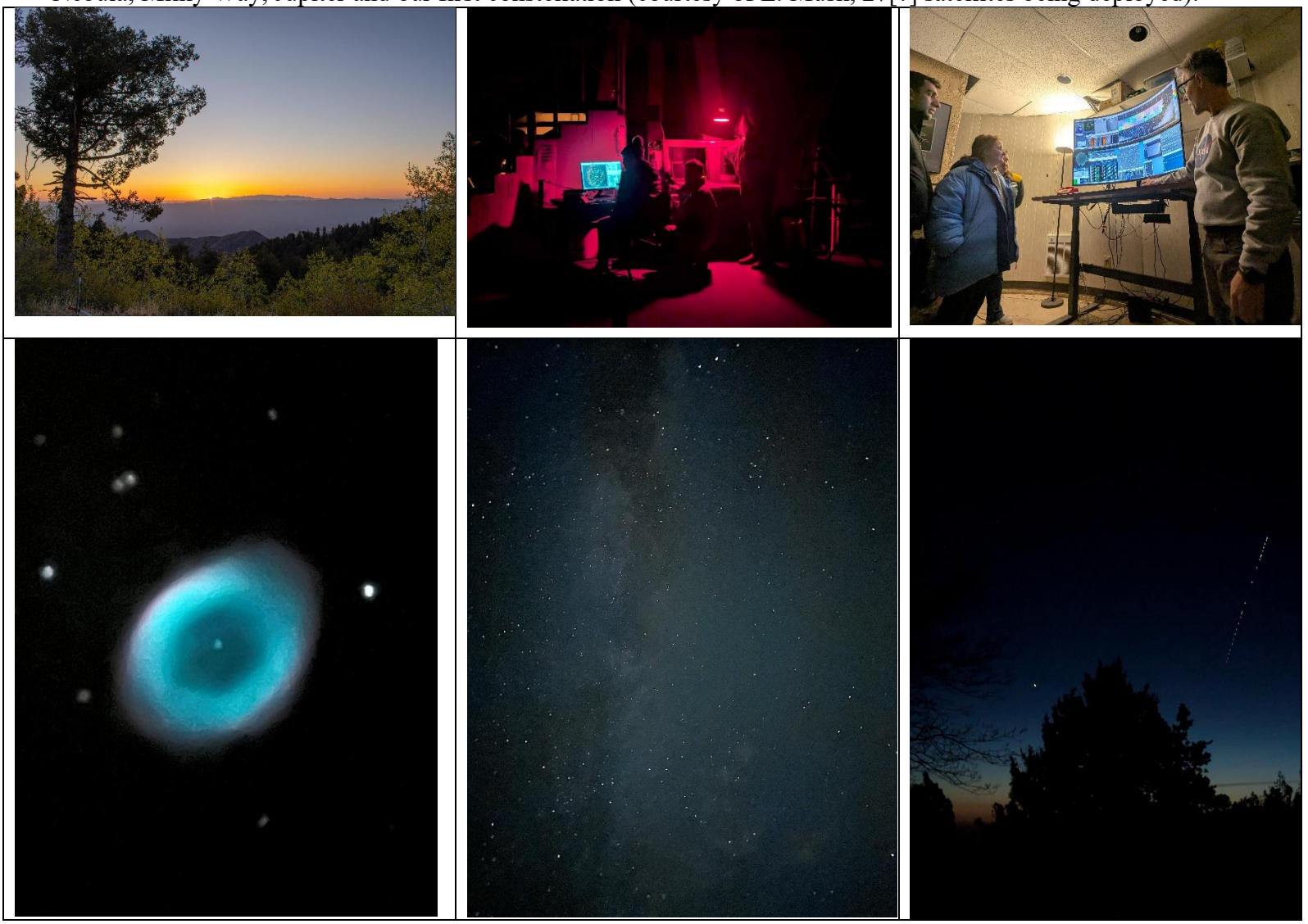




I was able to do a two-minute exposure with my smartphone at about 3:00 am on the morning of May 18 while on Mt. Lemmon, looking west [last year]. The Moon had just set, and it was still dark I was able to get down to fainter than magnitude 10! The binary is about magnitude 10.1. I have cropped it to make the location clearer. The bright star is Arcturus. What we are seeing is the red giant that is losing material to the white dwarf that is obscured by its accretion disk.

Some Pictures:

I am just back from Don's Adult Astronomy Camp and, if the fire is out, leave for Mt. Graham on Saturday May 31. Here are a few pictures from Camp. Note: Thanks to a small fire that closed the road and predicted rain over the weekend, we are going up on June 2. Here are a few of the pictures that campers and staff have uploaded (I still need to upload mine). I will post some more in the next Newsletter (when I get it out depends on the weather on Mt. Graham). Thanks to Christopher, Lucy, Fredrick, and Hy for these pictures. First row, right to left: sunrise over Mt. Graham, observing at the 61", our group at the Catalina Sky Survey. Second row, right to left: Ring Nebula, Milky Way, Jupiter and our first constellation (courtesy of E. Musk, 27[?] satellites being deployed).



Astronomy in the News

The Skies are not Quiet:

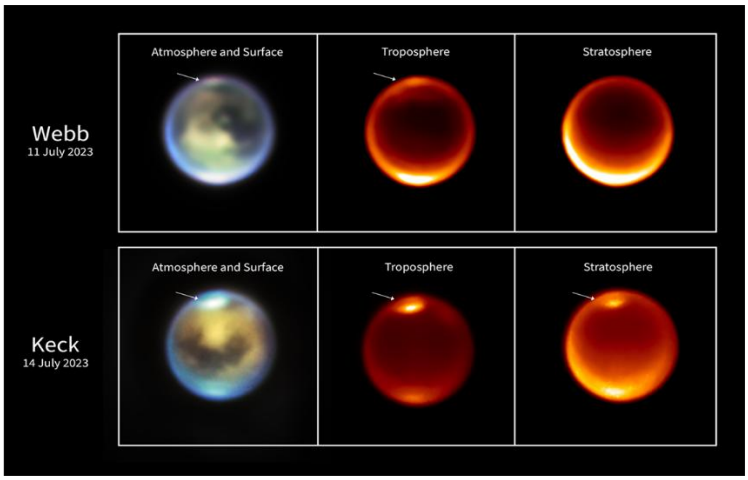
One of our campers, someone I know from many Zooms over the last two years, Carmen Artigas Moreno, came all the way from Uruguay for the Adult Astronomy Camp (plus visits with family on the East Coast). She is a lawyer working with the UN's Committee for the Peaceful Uses of Outer Space (dealing with Dark and Quiet Skies). She sent me the following article that summarizes the dangers of unintended electromagnetic radiation, radiation that leaks from communications satellites that may, someday soon, shut down most of the radio science being done around the world. Thank you for the article and thank you for the work you are doing to save our skies.

https://www.livescience.com/space/astronomy/no-radio-astronomy-from-the-ground-would-be-possible-anymore-satellite-mega-swarms-are-blinding-us-to-the-cosmos-and-a-critical-inflection-point-is-approaching

NASA, ESA, and Other Missions:

JWST, Titan—Cloudy with a Chance of Rain:

On Earth, we have a water cycle, where groundwater evaporates, creates convective clouds, and then rain completes the cycle. On Saturn's moon Titan, there is a similar cycle. However, because the temperatures are much lower on Titan (water ice is the surface rock), there is a methane cycle. Previously, convective clouds have been seen in the southern hemisphere of Titan. In this work astronomers used JWST and the Keck telescope on Mauna Kea. They observed, for the first time convective methane clouds, indicative of methane rain. This is significant as most of the surface lakes on Titan are in the northern hemisphere.



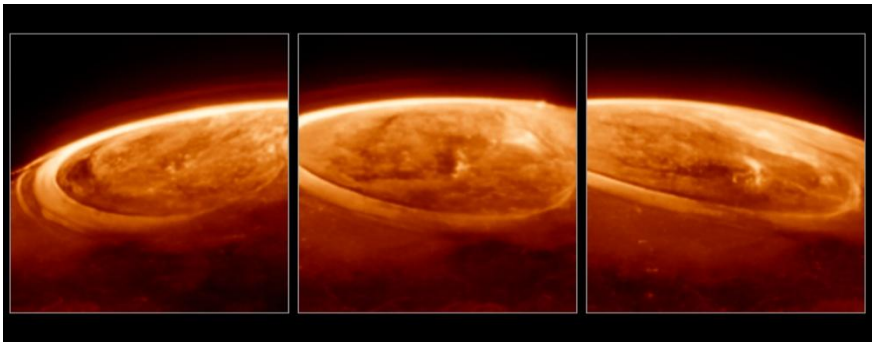
NASA's Webb telescope and the Keck II telescope in Hawaii obtained these views of Titan and its atmosphere on July 11 and July 14, 2023. Image via NASA/ ESA/ CSA/ STScI/ Keck Observatory/ Webb Space Telescope.t

https://webbtelescope.org/contents/news-releases/2025/news-2025-122.html

https://earthsky.org/space/titan-clouds-rain-methane-weather/

JWST, Jupiter Aurora:

A little closer to Earth (not much closer), JWST has studied Jupiter's massive aurora. On Earth, particles from the solar wind and solar storms interact with Earth's magnetic field to produce auroras (or aurorae), the Northern and Southern Lights. Auroras on Jupiter are much more spectacular. First, Jupiter's magnetic field is about 20,000 times stronger than Earth's magnetic field (I do not think that they mention this in the Press Release). In addition, there is another source of particles that is significantly greater than the solar wind, Io's volcanos. These two factors create significantly stronger auroras on Jupiter.



Close-up observations of aurorae (auroras) on Jupiter

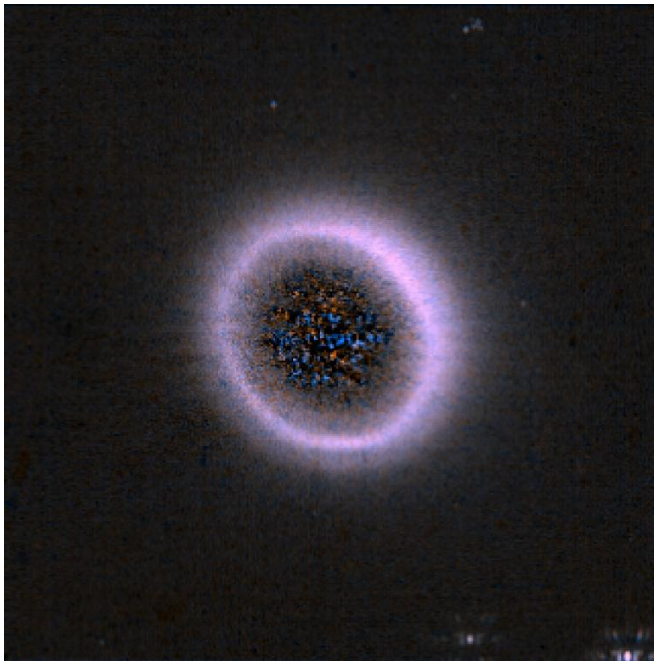
https://webbtelescope.org/contents/news-releases/2025/news-2025-108.html

JWST, Ice in Debris Disk Around Young, Sun-Like Star:

HD 181327 is a solar-type star that is about 155 light-years from us. It is a little hotter, a little larger, and a little more massive than the Sun, but is only half as luminous. It is estimated to be about 18 million years old. A debris disk had been seen previously by HST (visible and near infrared reflected light) and by ALMA (radio wavelengths, thermal emission). These observations found that the ring was composed of silicate grains and there was a hint of the

Debris Disk around star HD 181327 (artist's concept). Below, a NIRCam image of the debris disk

existence of water ice. The mass of the ring was also estimated to be about half the mass of the Earth (the mass of the Kuiper belt is estimated to be 1% the mass of Earth). The JWST observations have provided clear evidence of the iron sulfide, olivine, and crystalline water ice. The disk is from 85 AU to 113 AU from the star and the water ice content ranges from 0.1% at the inner edge to over 20% at the outer edge. No exoplanets have been detected around this star, but the debris disk is assumed to be the result of continual collisions of larger bodies, similar to our Kuiper belt. The collisions have to be on-going as water ice can only survive for a few thousand years before it is lost to sublimation and the effects of UV radiation.



https://earthsky.org/space/1st-discovery-of-frozen-water-in-young-star-system-hd-181327/

https://webbtelescope.org/contents/news-releases/2025/news-2025-119.html

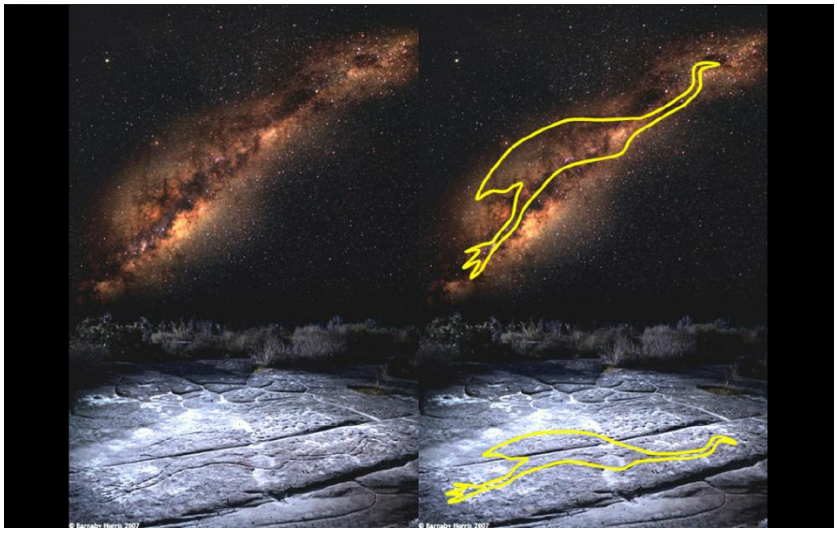
https://science.nasa.gov/missions/webb/another-first-nasa-webb-identifies-frozen-water-in-young-star-system/

June Night Sky

Sky Stories:

Emu in the Sky:

As I have written before, cultures in the Southern Hemisphere have "constellations" and myths surrounding the dark bands in the Milky Way. In April 2024, I wrote about the llama and her baby, as seen by the Inca of Peru. In Australia, as depicted to the right and below, is how the Aboriginal cultures of Australia view the dark constellations, such as the "Emu in the Sky," the male emu protecting its eggs. The "emu" encompasses several sky figures as seen by the Inca: the Partridge, the Llama and baby, the Fox, and the Hunter. The head of the Emu is the Southern Coalsack, in the Southern Cross and the body goes along the Great Rift. The bright star in the neck of the Emu is Alpha Centauri and the red star in its back is Antares in Scorpius. Aboriginal sky stories are thought to date back more than 10,000 years, long before the Western stories we are familiar with. Several of the sky



An image of the 'Emu in the Sky' (Milky Way) constellation, with the Emu engraving in Kuring-gai-Chase National Park, NSW below, as it might have appeared in an August evening. Credit: Barnaby Norris/Ray Norris. From Space Australia. Below: from BBC Sky at Night Magazine.

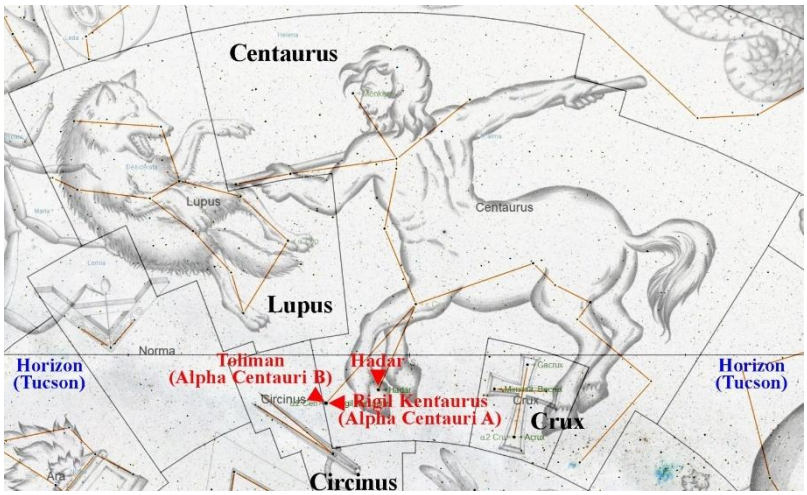
stories are in the links below. In general, the stories relate to the rising of the Emu in the sky and the female Emus' laying eggs, an important source of protein for the Aborigines.

https://spaceaustralia.com/news/moonhack-coding-story-emu-sky

https://www.ayersrockresort.com.au/stories/emu-in-the-sky

Featured Constellation: Centaurus

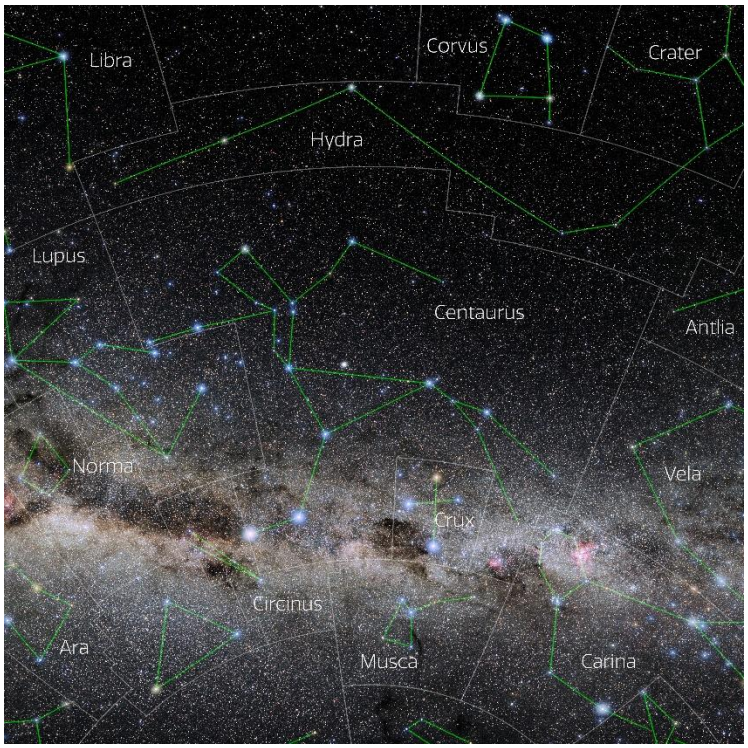
Our featured constellation this month is Centaurus, the Centaur. The Starry Night image on the right shows the usual stick figures. I have included illustrations of this constellation and a few surrounding ones. You will notice in the image that I have removed the horizon so that you can see the constellations that are below my horizon (and anyone farther north). At this time, most of Centaurus would be visible from where I live, but not its brightest stars. Centaurus was one of Ptolemy's 48 constellations and would have been completely visible to him, thanks to precession.



Looking South at about 9:30 p.m. (DST) on June 15

Centaurus has one star brighter than magnitude 0.0, one between magnitudes 0.0 and 1.0, one star between magnitudes 1.0 and 1.99, seven stars between magnitudes 2.0 and 2.99, 11 stars between magnitudes 3.0 and 3.99, and an additional 38 stars between magnitudes 4.0 and 4.99. Centaurus has as many as 91 known (both confirmed and candidate) exoplanets orbiting 70 stars. I should emphasize that some of these need to be confirmed and at least one, that I know of, that has been shown not to exist (see below). One of the 70 is a pulsar orbited by one exoplanet, and one is circumbinary (the exoplanet orbits both stars of a binary star system). The three brightest stars in Centaurus are Rigil Kentaurus (Alpha Centauri A) at magnitude -0.01, or 0.01, depending on the source (the 4th brightest star in the sky), Hadar (Beta Centauri), and Toliman (Alpha Centauri B) at magnitude 1.33.

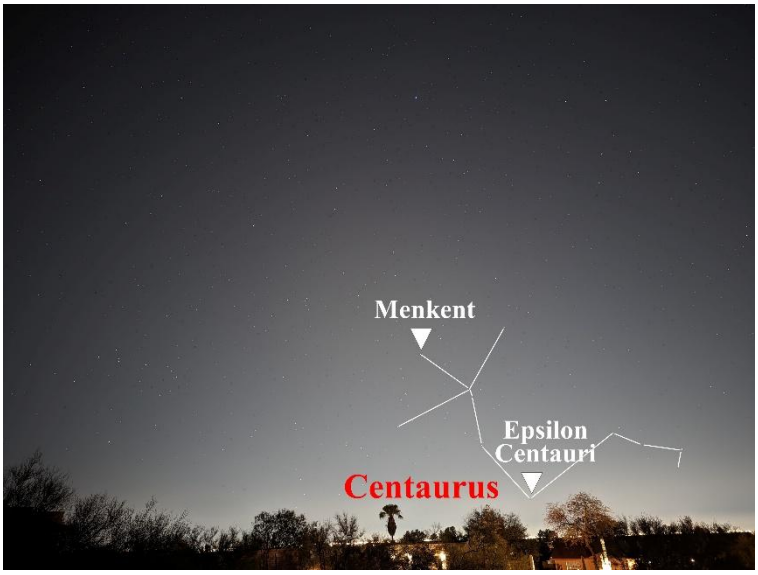
Rigil Kentaurus and Toliman are two stars of a three-star system. The faintest star of the system is Proxima Centauri, a red dwarf, that is the closest star to the Earth (other than the Sun). Rigil has one confirmed exoplanet, and Toliman was thought to have an exoplanet, but it has never been confirmed and so probably was a false detection. Proxima Centauri has two confirmed



Above: Photo of the constellation Centaurus with annotations from IAU and Sky & Telescope. Credit: E. Slawik/ NOIRLab/NSF/AURA/M. Zamani

exoplanets orbiting it. One other exoplanet is listed as "controversial/disputed."

Rigil Kentaurus (from the Arabic, "the Foot of the Centaur") is a G2 V (yellow) Main Sequence star. Rigil Kentaurus has a surface temperature (visible surface) of 5,800 K. It is about 1.5 times as luminous as the Sun with a mass that is about 1.08 times that of the Sun and a diameter that is about 1.22 times that of the Sun. Toliman (from the Arabic "the Ostriches" is a K2 V (orange) Main Sequence star. Toliman has a surface temperature (visible surface) of 5,200 K. It is about 0.5 times as luminous as the Sun with a mass that is about 0.91 times that of the Sun and a diameter that is about 0.86 times that of the Sun. Rigil Kentaurus and Toliman are about 4.34 light-years from us. They are estimated to be 5 billion years old. The two stars orbit each other at an average distance of 23.4 AU (an eccentric orbit that goes from 11.2 AU to 35.6 AU), with an orbital period of 79.8 years. Proxima Centauri, a red dwarf, the third component of this system, is 4.25 light-years from us. It orbits Rigil Kentaurus and Toliman at a mean distance of 8,700 AU, with an orbital period of 550,000 years.



This is the best I can do from Tucson. It was taken at about 5:00 a.m. It is a 4-minute exposure and is affected by city lights.

Hadar (from the Arabic "to be present" or "on the ground" or "settled, civilized area") is a triple star system with a combined magnitude of 0.61. Beta Centauri Aa and Beta Centauri Ab are a close binary, separated by about 0.02 arcseconds (with an eccentricity of 0.8), which translates to a mean separation of 4 AU and a period of 357 days. Beta Centauri Aa and Ab are both B1 III (blue) giant stars that have evolved off the Main Sequence. Aa has a surface temperature (visible surface) of 25,000 K. It is about 30,000 times as luminous as the Sun with a mass that is about 12 times that of the Sun and a diameter that is about 9 times that of the Sun. Ab has a surface temperature (visible surface) of 23,000 K. It is about 25,000 times as luminous as the Sun with a mass that is about 10.6 times that of the Sun and a diameter that is about 8.5 times that of the Sun. The third component, Beta Centauri B, has a mean separation of about 200 AU with an orbital period of about 290 years. It is a B (blue) Main Sequence star, at magnitude 4. The Hadar star system is about 360 light-years from us and is estimated to be about 14 million years old.

Telescope, Binocular, and Camera Targets:

Early June is our last chance to see Jupiter in the evening sky. Mars is getting lower in the western sky and a little fainter but will be visible all month. If you get up before sunrise, you will get to see Venus and Saturn. Around mid-June, Mercury will be in the evening sky.

Moon and Planets:

New Moon was on May 26. First Quarter Moon is on June 2. June's Full Moon, the Strawberry Moon, is on June 11, early morning. Last Quarter Moon is on June 18. The next New Moon is on June 25.

> *From Timeanddate.com:*
> "The wild strawberries that start to ripen during early summer gave name to June's Full Moon. Other names for this Full Moon are Rose Moon, Hot Moon, and Mead Moon.
>
> "June's Full Moon is named after the wild strawberries that ripen this month and could be gathered by the Native American tribes. Other native names are Berries Ripen Moon, Green Corn Moon, and Hot Moon.
>
> "The Celtic names are Horse Moon, Dyan Moon, and Rose Moon. Other English names are Flower Moon and Planting Moon. Other sources quote Mead Moon as the Anglo-Saxon name because this was the time for mowing the meads, or meadows."

From Space.com:

"June was the time to harvest the ripening strawberries hence the name Strawberry Moon, known to every Algonquin tribe.

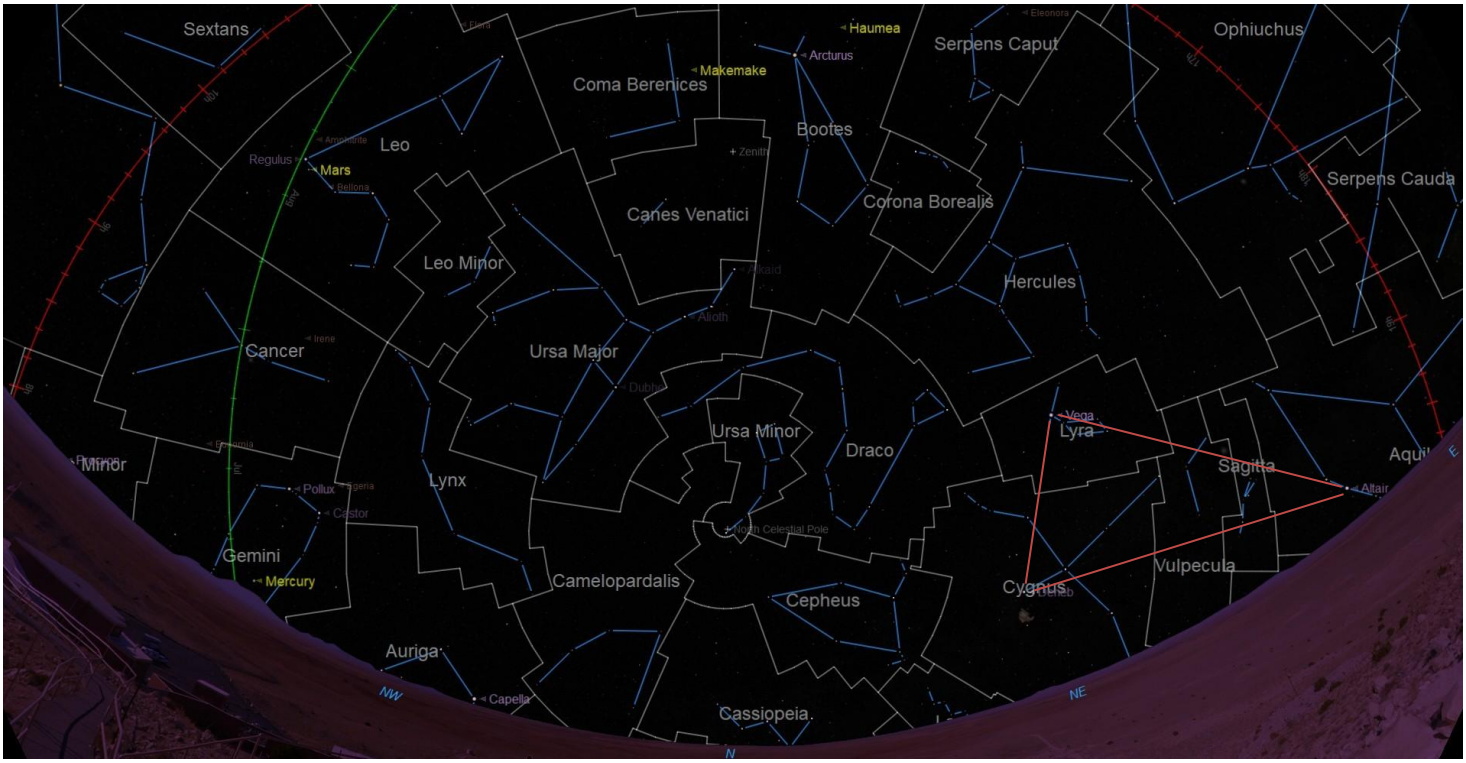
"According to the Farmer's Almanac, it was also known as the Berries Ripen Moon (Haida), Birth Moon (Tlingit), Green Corn Moon (Cherokee) and the Hatching Moon (Cree) to name but a few."

The Moon will be at perigee (363,180 km [225,670 miles] from Earth) on June 22. The Moon is at apogee (404,626 km [251,423 miles] from the Earth) on June 7.

On June 1, the waxing crescent Moon passed 1.4 degrees north of Mars at 6:00 a.m. (EDT). You will need to observe this the previous day or that night, but the Moon will be much farther away. On June 8, Mercury will pass 2 degrees north of Jupiter at 4:00 p.m. (EDT). Observe this later in the evening, but the sky will be fairly bright and the two will be low in the west. On June 10, the Full Moon passes 0.3 degrees south of Antares at 7:00 a.m. On June 18, the Last Quarter Moon passes 3 degrees north of Saturn at midnight and then passes 2 degrees north of Neptune. On June 22, the waning crescent Moon passes 7 degrees north of Venus at 5:00 a.m. and then 5 degrees north of Uranus at midnight (observe this that morning). On June 27, the two-day-old waxing crescent passes 3 degrees north of Mercury at 2 a.m. (observe that evening) after sunset. On June 29, the waxing crescent Moon passes 0.2 degrees north of Mars at 9 p.m. (in the western US, observe this after sunset).

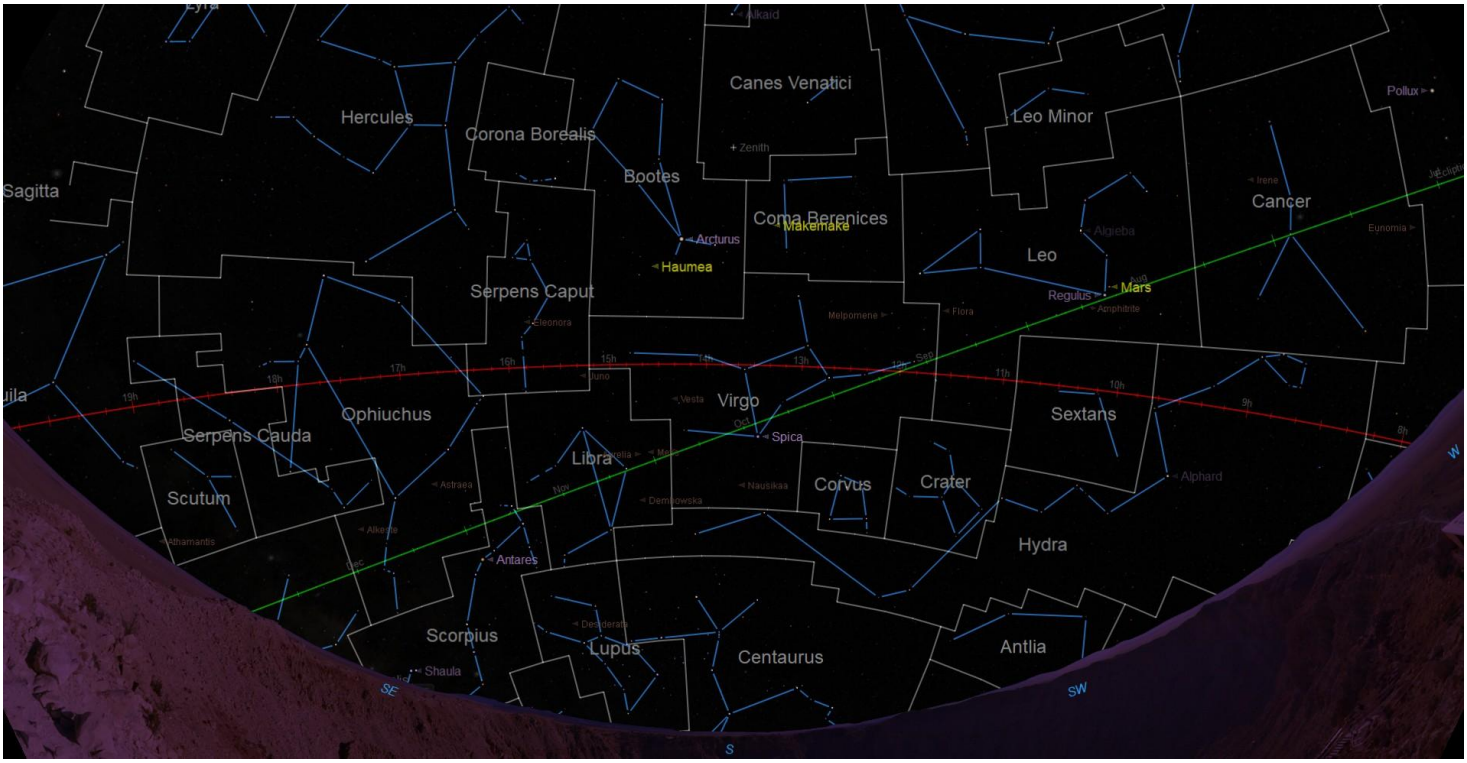
Early Evening Sky Viewing:

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 June 15, 2025, sunset is at 7:31 p.m. (17 minutes later than on May 15), Civil Twilight is at 8:00 p.m. (19 minutes later), Nautical Twilight is at 8:35 p.m. (21 minutes later), and Astronomical Twilight is at 9:12 p.m. (23 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 14 hours and 15 minutes on June 15 (26 minutes longer than on May 15). **Times will also vary depending on where you are in your time zone and your latitude. In New York, sunset is at 8:29 p.m. on June 15 (23 minutes later than on May 15). The length of the day in New York is 15 hours 05 minutes on June 15 (47 minutes longer than on May 15).**



June 15, 2025, looking North at 9:30 p.m. (DST, 8:30 MST and HST). The + marks the Zenith (overhead). This is close 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 9:30 p.m. (DST, 8:30 p.m. in Arizona and Hawaii) in mid-June, 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. Almost completely set in the northwest are Auriga (the Charioteer), Gemini (the Twins), and Canis Minor (the Little Dog). Mercury is Gemini in mid-June. Very low and almost north is Cassiopea (the Queen)—it is a circumpolar constellation and so will be higher above the horizon for those of you in the northern US. Low in the northwest is Camelopardalis (the Giraffe). Also low in the northwest/west are Lynx (the Lynx), Cancer (the Crab), and Hydra (the Water Snake). Hydra is very long and much of it is also visible looking southwest. East of Lynx and Cancer, but still to the west of north, are Ursa Major (the Great Bear), almost on his tail, Leo Minor (the Little or Smaller Lion), and Leo (the Lion). Both lions are on their backs. Mars is now in Leo. Ursa Minor (the Little Bear), Canis Venatici (the Hunting Dogs), Coma Berenices (Berenice's Hair) are all due north, above Polaris. Low in the northeast is Cepheus (the King). Above Cepheus are Draco (the Dragon) and Boötes (the Herdsman). Right (east) of Draco and Boötes are Lyra (the Lyre), Hercules (the Hero), and Corona Borealis (the Northern Crown). Just rising in the northeast are Cygnus (the Swan), Vulpecula (the Little Fox), and Sagitta (the Arrow). Rising in the east is Aquila (the Eagle). Best viewed looking south are Serpens Caput (the Head of the Serpent), Ophiuchus (the Serpent Bearer), and Serpens Cauda (the Tail of the Serpent). The Summer Triangle is now in the evening sky—Deneb (in Cygnus), Altair (in Aquila), and Vega (in Lyra.

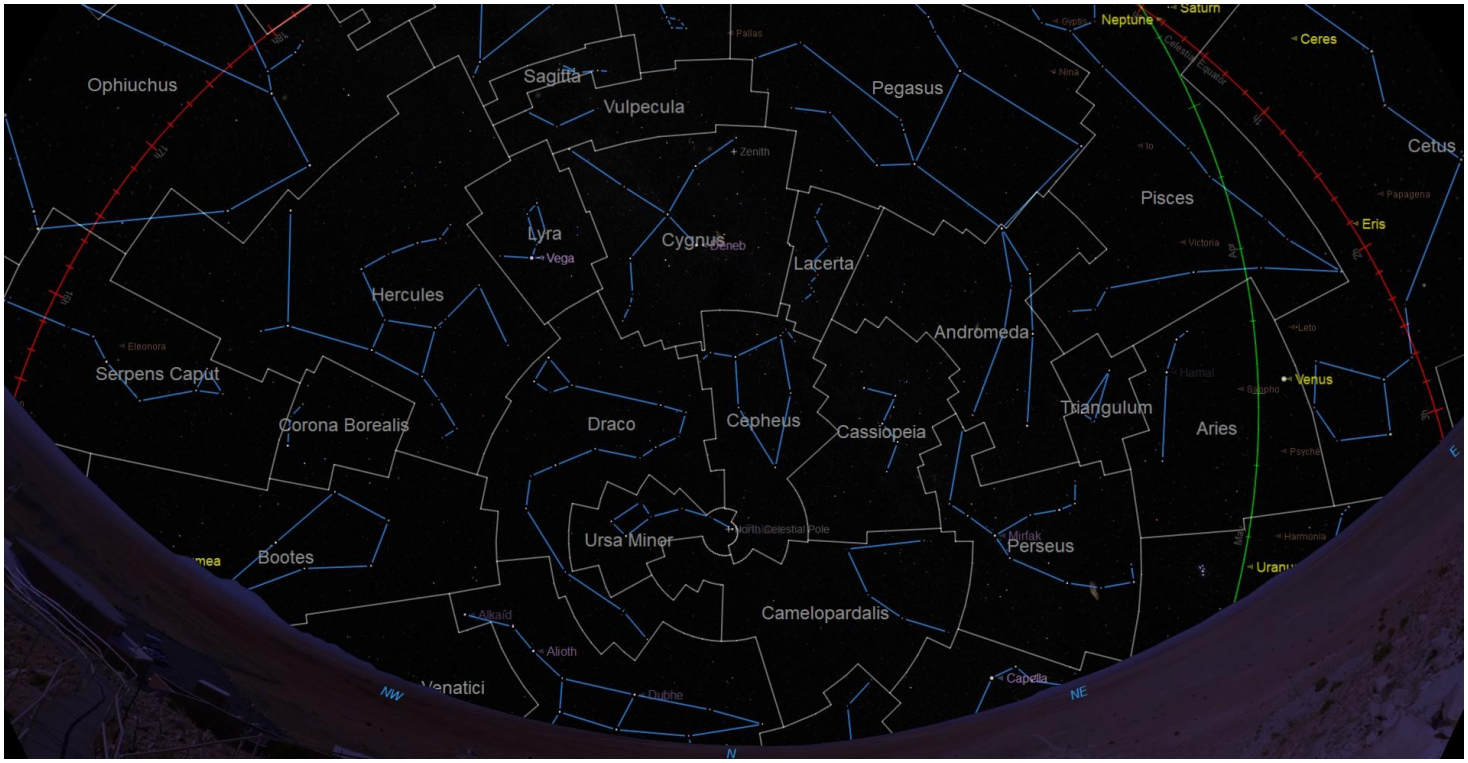


June 15, 2025, looking South at 9:30 p.m. (DST). The + marks the Zenith (overhead).

Describing constellations not discussed above, looking South, at 9:30 p.m., by mid-June, just west of south, but stretching across the whole sky is Hydra (the Water Snake). Its head will soon the setting. Hydra is the largest constellation, as well as the longest. Its area is 1,303 square degrees and 100 degrees long. Below Hydra is Antlia (the Pump), almost set. Above Hydra from west to east are Sextans (the Sextant), Crater (the Crater), and Corvus (the Crow). Above Corvus and west of due south is Virgo (the Maiden). Centaurus (the Centaur), our featured constellation, is just west of south. Lupus (the Wolf) is east of Centaurus and Scorpius (the Scorpion) is rising low in the southeast. Above Lupus and Scorpius and just east of due south is Libra (the Scales). Farther east, after Ophiuchus and just rising in the southeast is Scutum (the Shield).

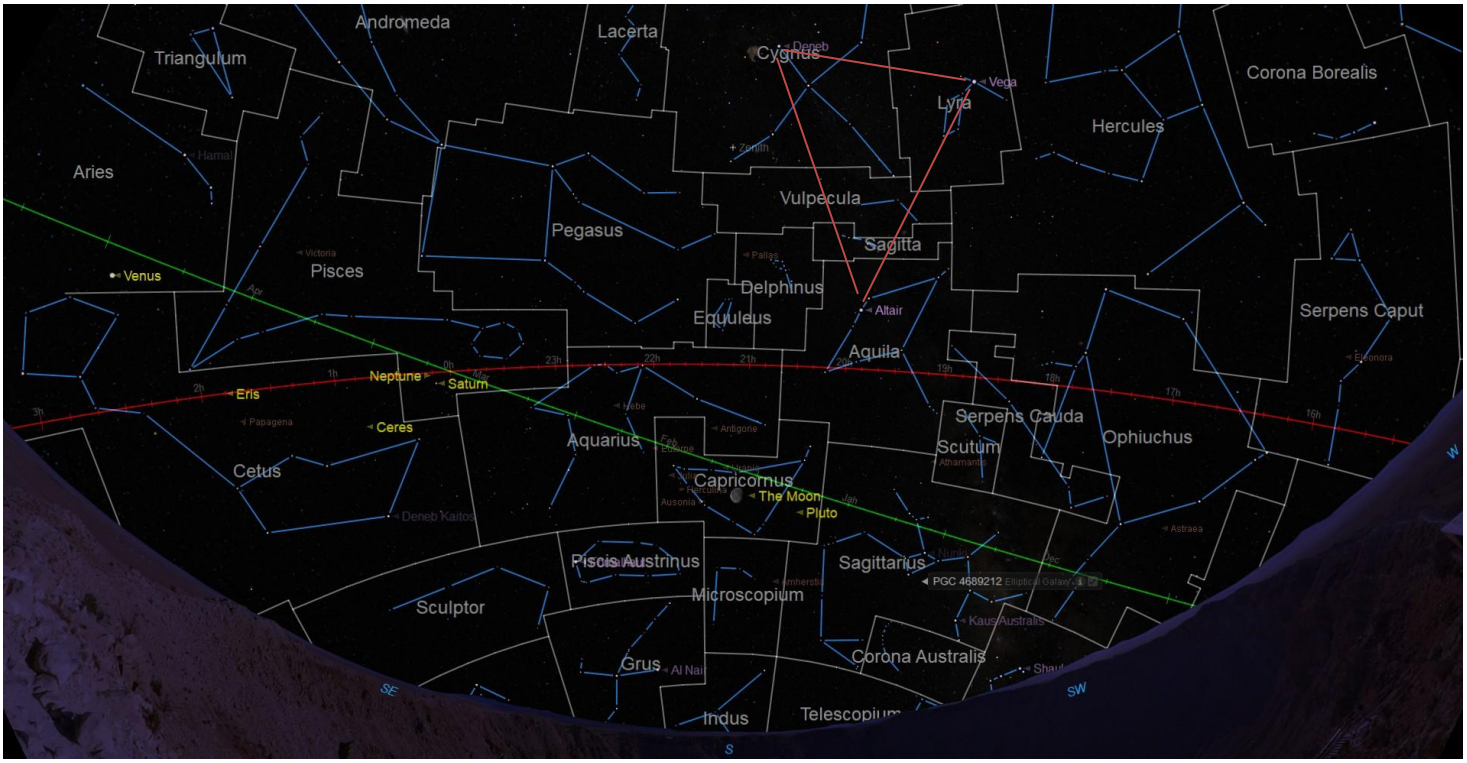
Early Morning Sky Viewing:

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 June 15, in the morning, Astronomical Twilight is at 3:36 a.m. (15 minutes earlier than on May 15), Nautical Twilight is at 4:13 a.m. (13 minutes earlier), Civil Twilight is at 4:48 a.m. (10 minutes earlier), and sunrise is at 5:16 a.m. (9 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 5:24 a.m. on June 15 (14 minutes earlier than on May 15).**



June 15, 2025, looking North at 5:00 a.m. (DST). The + marks the Zenith (overhead). This is before Nautical Twilight, so the sky is still fairly dark.

Looking North at 5:00 a.m. (DST, 4:00 a.m. in Arizona and Hawaii) in mid-June, 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). Just setting are Canes Venatici (the Hunting Dogs), Boötes (the Herdsman), Serpens Caput (the Serpent Head), and Ophiuchus (the Serpent Bearer). Ursa Major (the Great Bear), now on his feet, and Camelopardalis (the Giraffe) are low in the north and may be below your horizon if you are in the southern part of the US. Low in the northwest is Corona Borealis (the Northern Crown). Above Corona Borealis is Hercules (the Hero). West of Polaris are Ursa Minor (the Little Bear) and Draco (the Dragon). Above Draco and just west of north are Cygnus (the Swan), Lyra (the Lyre), Sagitta (the Arrow), and Vulpecula (the Little Fox). Just east of due north are Cepheus (the King) and Cassiopeia (the Queen). Above Cepheus and Cassiopeia is Lacerta (the Lizard). High in the northeast are Pegasus (the Flying Horse) and Andromeda (the daughter of Cassiopeia). Below Andromeda and low in the northeast is Perseus (the Hero). Above Perseus, going from northeast to east, are Triangulum (the Triangle), Aries (the Ram), and Pisces (the Fishes). Venus is in Aries and Uranus is in Taurus (the Bull), which has yet to rise. Cetus (the Sea Monster or Whale) is probably better seen looking east/southeast.



June 15, 2025 looking South at 5:00 a.m. (DST). The + marks the Zenith (overhead).

Looking South in mid-June at 5:00 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 Telescopium (the Telescope), almost set, Indus (the Indian), and Grus (the Crane). Above these, from west to east are Corona Australis (the Southern Crown), Microscopium (the Microscope), Pisces Austrinus (the Southern Fishes), and Sculptor (the Sculptor). Low in the west, above Corona Australis is Sagittarius (the Archer) and, just west of due south, Capricornus (the Horned Goat). Just east of due south is Aquarius (the water bearer). To the east of Ophiuchus, higher in the southwest are Serpens Cauda (the Tail of the Serpent) and Scutum (the Shield). East of Scutum and just west of dues south are Aquila (the Eagle), Delphinus (the Dolphin) and Equuleus (the Little Horse). We can now see all of the Summer Triangle, Altair (Aquila), Vega (Lyra), and Deneb (Cygnus). We can now see more of Cetus and Pisces (with Neptune and Saturn).

Where are the Planets?

Mercury was at superior conjunction (far side of the Sun) on May 29, and so becomes an evening object early in June. Mercury and Jupiter will be close together, within about 2 degrees, on June 8. This may be your last chance to see Jupiter. Mercury will be at magnitude -1.1 and Jupiter will be at magnitude -1.9. At this time, Mercury will be in Taurus, moving into Gemini the next day. Even though it will be getting closer to us and a little higher in the sky, Mercury will be fading. It will be between -0.07 and 0.02 between June 22 and 24 as it passes by Pollux and Castor in Gemini. Mercury moves into Cancer on June 25, fading to magnitude 0.4 by the end of June. On June 26, the 2-day-old waxing crescent Moon passes by Mercury.

Venus continues to be a morning object and visible in the morning sky all month. Venus starts the month at magnitude -4.3 and fades to magnitude -4.1 at the end of the month. Venus was at greatest western elongation on May 31, so, through a telescope, you would see a gibbous Venus all month. Venus starts out the month in Pisces, spends about a day, June 9-10, in Cetus, is in Aries, until June 28, and then moves into Taurus. The waning crescent Moon passes Venus on June 22.

Mars is in our evening/night sky all month but is setting before midnight by the end of June. Mars is in Leo all month. Mars starts out the month at magnitude 1.3 and fades to magnitude 1.5 by the end of the month.

Jupiter is in Taurus all month. Its encounter with Mercury on June 8 may be the last time we see it until it appears in our morning sky.

Saturn continues to be a morning object, rising earlier and earlier every day. It will be August before Saturn becomes an evening object. By the end of June, Saturn is rising just before midnight in Tucson (an hour later for all but Arizona and Hawaii). Saturn is in Pisces all month. Saturn starts the month at magnitude 1.1 and ends the month at magnitude 1.2.

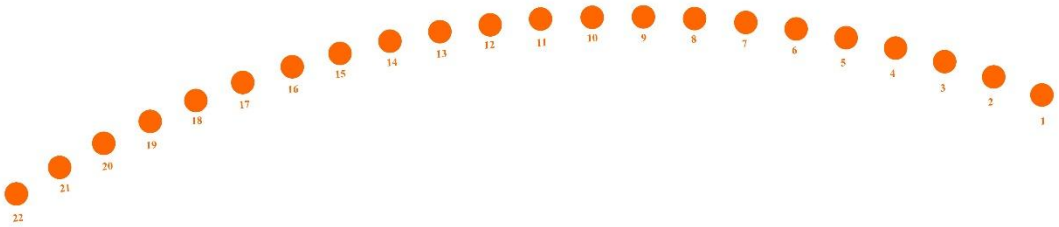
Uranus was in conjunction with the Sun on May 17. It will be a difficult morning target for much of June. However, it will be easier to spot on June 30 when it is only 5 degrees northeast of Venus. Uranus is at magnitude 5.8 all month.

Neptune is in Pisces all month. It is close to Saturn all month. Neptune is at magnitude 7.9 all month. With a telescope, Saturn is a good starting point to find Neptune in the sky. They are about 1.5 degrees apart all month.

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 June only. I have given the relative positions for June 18, 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 June 18, **Mercury** is visible low in the southwest. At the same time, **Mars** is higher in the west. You need to continue to rotate until just after midnight (the Sun at your back). It is only then that you can see **Saturn** (rising over your left shoulder just after midnight) and then **Venus. Jupiter** is too close to the Sun to be seen until sometime in July. This model does not include Uranus and Neptune (or Pluto), but with binoculars or a small telescope, Neptune is visible at this time, near Neptune.



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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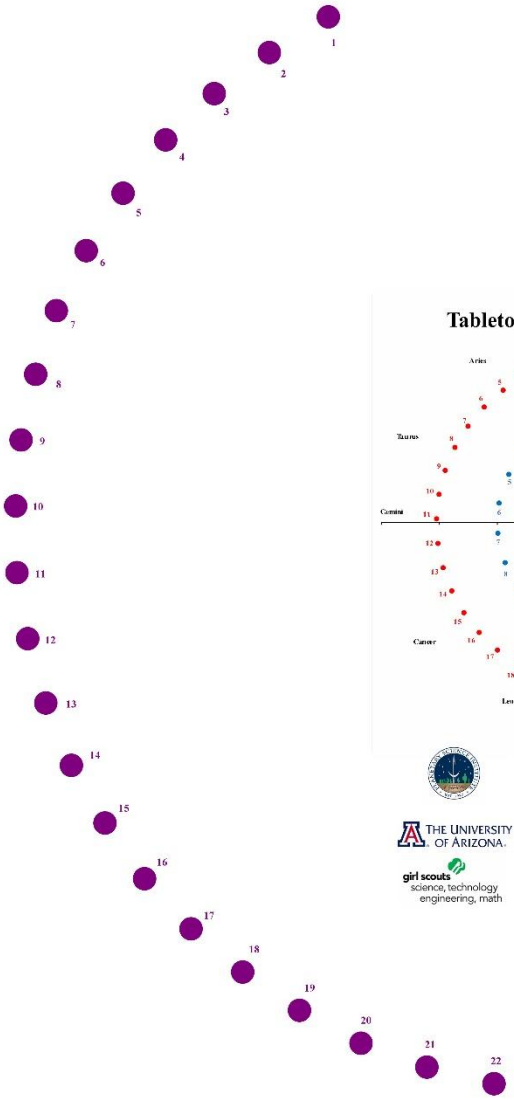
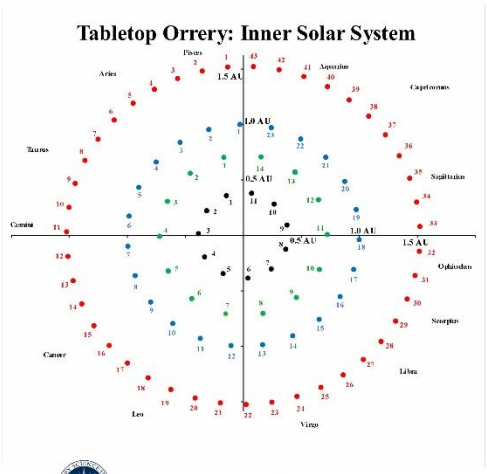
21 12/1/27
22 2/19/28





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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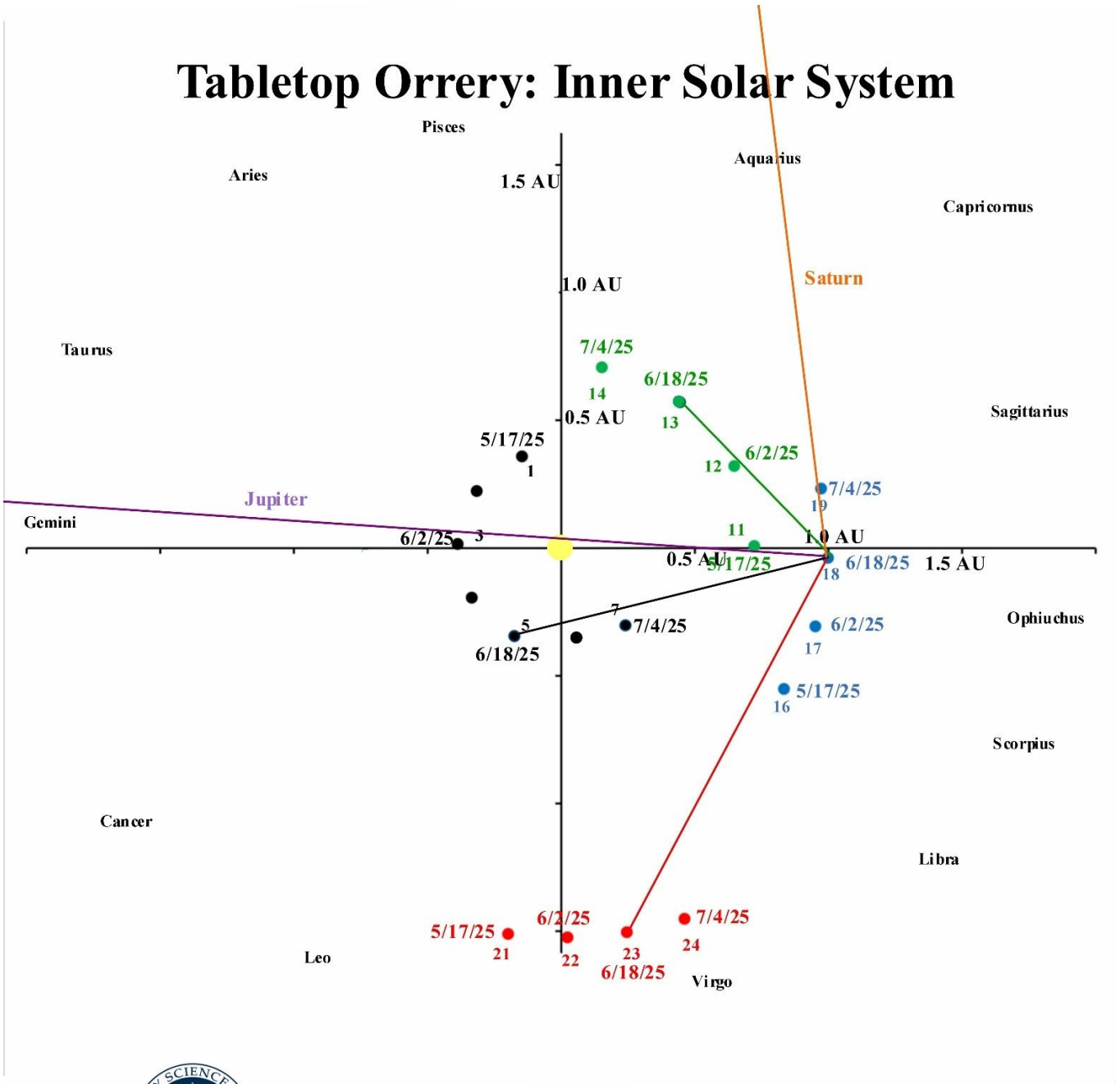
girl scouts
science, technology
engineering, math

Tabletop Orrery: Inner Solar System



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