



Temecula Valley Astronomer

The monthly newsletter of the Temecula Valley Astronomers June 2022

Events: General Meeting, Monday, June 20, 2022, at the Ronald H. Roberts Temecula Library, Room B, 30600 Pauba Rd, and/or ZOOM, at 6:00 PM.

- IFI & Gallery by Clark Williams
- Presentation on The Psyche Mission by Yudhister Kumar
- Refreshments by TBA

Star Parties at South Coast Winery every Friday evening in June.

For upcoming school Star Parties check the Calendar on the [web page](#).

WHAT'S INSIDE THIS MONTH:

Cosmic Comments
by President Mark Baker

Looking Up Redux
compiled by Clark Williams

Random Thought – A Different Perspective
by Chuck Dyson

Another Look
by Dave Phelps

Solstice Shadows
by David Prosper (NASA/JPL)

Send newsletter submissions to Paul Kreitz <pkreitz@sbcglobal.net> by the 20th of the month for the next month's issue.

Satellite Light Pollution-

The light pollution caused by satellites is quickly becoming a major problem for astronomers and astrophotographers. See Mark Baker's *Cosmic Comments* for more information.



General information:

Subscription to the TVA is included in the annual \$25 membership (regular members) donation (\$9 student; \$35 family).

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Cosmic Comments – June 2022

By Mark Baker

We have had a running theme for TVA in 2022 so far involving Near Earth Objects, Potentially Hazardous Meteoroids, and Planetary Defense, but I would like to bring it even closer to home. Many of us know that there are almost 5,000 satellites currently orbiting our planet, low earth to geosynchronous positionings. Most are functioning, but a quantity are pure junk... even the infamous Starlink satellites have about an 8% failure rate. Not only do they already provide concerns at the observational and imaging levels, but too many don't even work!!! There is much discussion at many levels about how to best serve what has become an essential need (wi-fi) without disrupting our view of the heavens. Some say to move all telescopic research to LEO, but that just puts such tools right in the thick of things. Some tout geosynchronous orbits as a solution, but latency would be adversely affected and, as member Curtis Croulet advised at the last Greenway talk, one such satellite actually interferes with his ability to image M42, the Orion Nebula!!! And since I brought it up, the Greenway Talk of 5/21/22 contained a lot of great information derived from extensive research on just how dangerous the current satellite trends might be... I'd advise you all to look it up on the Palomar Observatory YouTube channel. And I don't necessarily mean a "sky is falling" danger, but how quickly they just might take our skies from us...

By the end of the decade, Starlink alone will increase satellite presence TEN FOLD... and if you add in all the other projections, we could be looking at **100,000 satellites** in LEO by then!!! Let that number sink in... think of all the occultations alone we will be encumbered by!!!

And this may just be the tip of the iceberg when it comes to overall hazards for humanity and the planet in general... but those are topics for another day!! But forewarned is forearmed so not all is doom and gloom – yet!!!

Thanks for all TVA does to provide awareness about the awesome sights and the beauties, natural or man-made, but also for the dangers they both may contain... keep LOOKING UP!!!
Clear, Dark Skies



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Looking Up Redux – June 2022

Compiled by Clark Williams

from these sources:

SeaSky.org

Wikipedia.com

in-the-sky.org

The American Meteor Society, Ltd.

cometwatch.co.uk

NASA.gov

TVA App (2.0.1296)

FullAndNewMoon App (2.0)

Starry Night Pro Plus 7 (7.6.3.1373)

SkySafari 6 Pro (6.1.1)

Stellarium (0.18.2)

timeanddate.com/astronomy

<https://www.fourmilab.ch/earthview/pacalc.html>



ALL TIMES ARE LOCAL PACIFIC TIME (PST / PDT) UNLESS NOTED OTHERWISE

Times are given in 24-hour time as: (hh is hours, mm minutes, ss seconds)

hh:mm:ss or hhmmss

hhmm+ (time of the next day)

hhmm- (time of the previous day)

hhmm (seconds not shown)

yyyymmddThhmmss (Full date as: year month day Time separator hours minutes seconds)

Moon Phases for the month by date:

Tuesday	the 14th	@ 0452 FULL in OPHIUCHUS
Monday	the 20th	@ 2011 THIRD QTR in PISCES
Tuesday	the 28th	@ 1953 NEW in GEMINI
Tuesday	the 7th	@ 0749 First QTR in LEO

Apogee comes on 2022-06-02 @ **0115** – 406,190 km (252,395 mi)

Perigee comes on 2022-06-14 @ **2323** – 357,433 km (222,099 mi)

Apogee comes on 2022-06-29 @ **0610** – 406,580 km (252,2638 mi)

2022 has: (13) new moons, (13) 1st Qtr moons, (12) Full moons, (12) 3rd Qtr moons

(0) Blue moon and (2) Black moons

Daylight Savings: Starts: 2022-Mar-13 : Ends: 2022-Nov-06

Luna: Luna is waxing crescent on the first of the month, headed for 1st quarter on the 7th rising at **0707**, transiting at **1442** and setting by **2218**. Luna by mid-month is 95% illuminated. Rising at **2154** and transiting at **0252+** setting at **0750+**. By the-end-of-the-month Luna is 2 days past new.



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3.8% illuminated rising at **0648** transiting at **1419** and setting by **2145**.

Highlights: (distilled from: **SeaSky.org** and **Clark's planetary Orrey** program[s])

June 14 - Full Moon, Supermoon. The Moon will be located on the opposite side of the Earth as the Sun and its face will be fully illuminated. This phase occurs at 1152 UTC. This full moon was known by early Native American tribes as the Strawberry Moon because it signaled the time of year to gather ripening fruit. It also coincides with the peak of the strawberry harvesting season. This moon has also been known as the Rose Moon and the Honey Moon. This is also the first of three supermoons for 2022. The Moon will be near its closest approach to the Earth and may look slightly larger and brighter than usual.

June 16 - Mercury at Greatest Western Elongation. The planet Mercury reaches greatest western elongation of 23.2 degrees from the Sun. This is the best time to view Mercury since it will be at its highest point above the horizon in the morning sky. Look for the planet low in the eastern sky just before sunrise.

June 21 - June Solstice. The June solstice occurs at 0905 UTC. The North Pole of the earth will be tilted toward the Sun, which will have reached its northernmost position in the sky and will be directly over the Tropic of Cancer at 23.44 degrees north latitude. This is the first day of summer (summer solstice) in the Northern Hemisphere and the first day of winter (winter solstice) in the Southern Hemisphere.

June 29 - New Moon. The Moon will be located on the same side of the Earth as the Sun and will not be visible in the night sky. This phase occurs at 0253 UTC. This is the best time of the month to observe faint objects such as galaxies and star clusters because there is no moonlight to interfere.



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Algol minima: (All times Pacific Time)

06/03/2022	1629
06/06/2022	1318
06/09/2022	1007
06/12/2022	0656
06/15/2022	0345
06/18/2022	0034
06/20/2022	0922
06/23/2022	1811
06/26/2022	1500
06/29/2022	1149

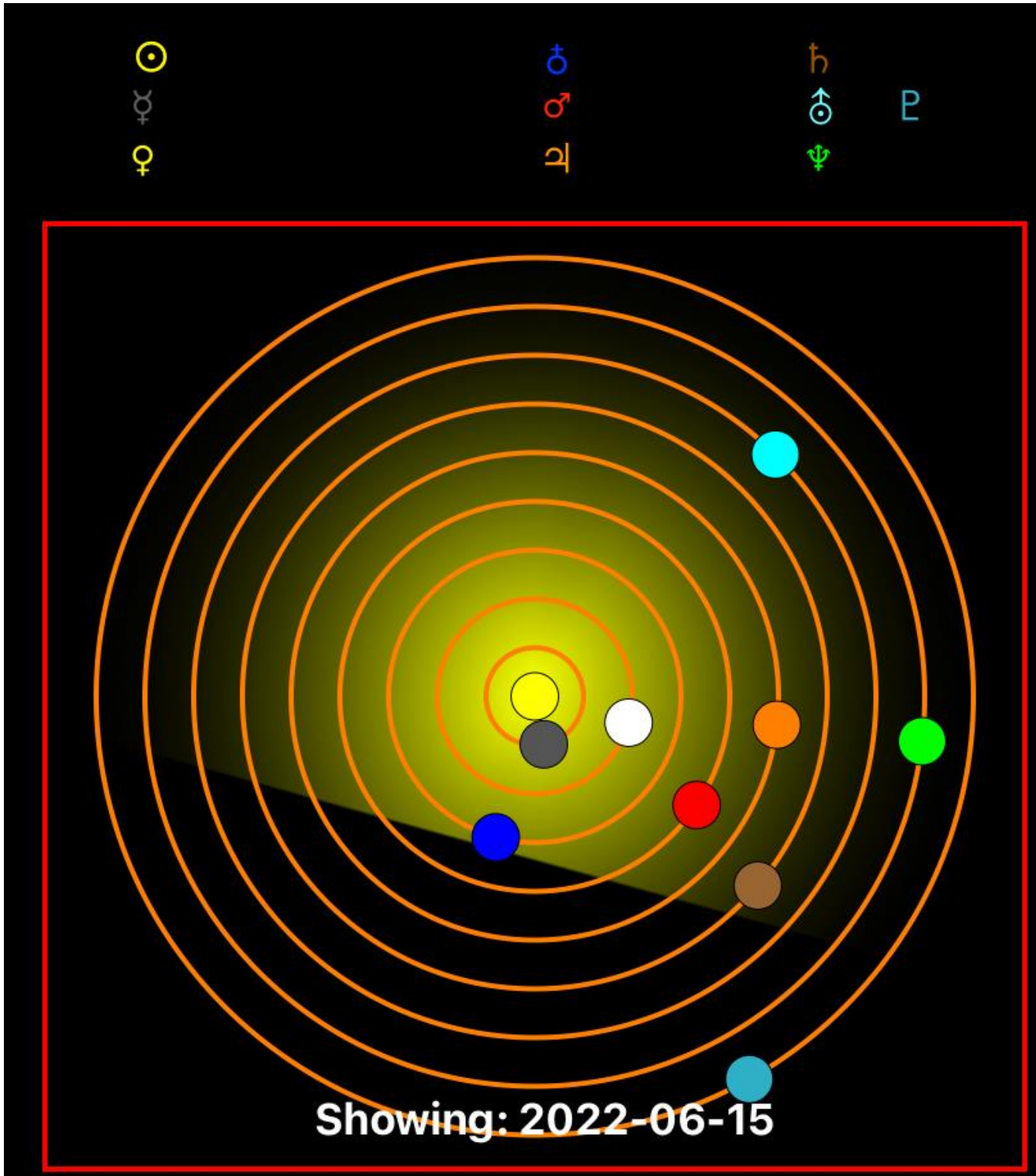




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Planets:



Planetary Positions June 2022: (from TVA App iOS version)



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- **Mercury:** Mercury is a morning object in the beginning of the month. It is illuminated at 9% and 2.66 apparent magnitude. Mercury rises at **0500** with the sun following at **0538**. Mercury transits at **1147** and sets at **1833**. Mercury by mid-month is still a morning object very close to the Sun. Mercury rises at **0423**, transits at **1114** and sets at **1805**. **DO NOT LOOK DIRECTLY AT THE SUN!** By the end-of-month. Mercury is still visible rising at **0429** followed by sunrise at **0540**. Mercury transits at **1137** and sets at **1846**.
- **Venus:** Is the morning star on the first of the month, rising by **0346**, with sunrise at **0538**. By mid-month Venus is rising at **0341** followed by sunrise at **0536**. By the end of the month Venus is rising at **0342** followed by sunrise at **0540**.
- **Mars:** Mars is back in the sky on the first rising at **2341**, transiting at **0443+** By mid-month and Mars is rising at **2256** and transiting at **0358+**. End-of-month finds the Warrior rising at **2204** and transiting at **0303+**.
- **Jupiter:** Jupiter is a morning object on the first of the month rising at **1738** and transiting at **2259** finally setting at **0421+**. By mid-month Jove is rising at **1637** transiting at **2159**. Come the end-of-month Jupiter is peaking above the horizon by **1534** transiting at **2057**.
- **Saturn:** Saturn rises in the early morning **0035** on the 1st. Saturn transits at **0600+**. Saturn by mid month is rising by **0017** and transits at **0525**. By the end-of-the-month Saturn rises at **0239** followed by sunrise at **0540**.
- **Uranus:** On the first of the month Uranus is a morning object rising at **0428**. By the ides Uranus has moved slightly ahead of the sun rising at **0336**, followed by sunrise at **0536**. End-of-month finds Uranus rising at **0111** followed by, sunrise at **0541**.
- **Neptune:** Neptune rises by **0204** in the beginning of the month. By the 15th Neptune rises by **0110**. By the end of the month Neptune is rising at **0011**.
- **Pluto:** Pluto on the first of the month is only at mag 14.34 so finding it is problematical. By mid-month Pluto has brightened to +14.32. By the end-of-the-month Pluto is at 14.30 and rising at **2103** and transiting at **0203+**.

Asteroids:

- Still a dearth of asteroids. I searched for asteroids in 2022 with a reasonable magnitude; say less than or equal to +10 in June there is nothing except the regulars: Juno, Vesta, Hebe, Eros and Herculina. So consult your local planetarium software or try:
<https://www.asteroidsnear.com/year?year=2022>

Meteors:

- Maybe next month.

June is great for both viewing and imaging. Spend some time outside with your scope. Summer is coming.

For now – Keep looking up.



RANDOM THOUGHT

By Chuck Dyson

A DIFFERENT PERSPECTIVE PART ONE

Matt is both a friend and a professional colleague of mine and we worked together on the same heart team for many years until I retired. Around 2005 several members of the Valley Astronomy Club, myself included, would book a full or half night on the 60 inch reflector at the Mt. Wilson Observatory once or twice a year. I think that several of the observatory volunteers and one of the tech staff were members of the club helped us get the nights that we wanted. On one occasion I asked Matt, a science enthusiast but no astronomer, if he wanted to go with us and this article and next month's is the writeup he gave me describing his impressions of the experience.

Matt's Words

When I was approached by my boss, Chuck, about going to a stargazing event held on Mount Wilson, I figured "Sure, why not?" Little did I know what was in store for me there. Quite honestly, I thought I would explore only a few items of interest the entire evening. The decision to go was based primarily on an internal drive to experience all life has to offer. My greatest fear is having regrets on my deathbed. It also should be noted that I have an ongoing interest in the relation between the quantum world and astronomical physics. As an elementary school student I elected to take an astronomy course over the summer offering me an exciting look into the vastness of the universe. With this in mind, the stargazing offer was accepted with an immediate response.

The event arrived sooner than anticipated. My truck was in the shop and my wife and two kids were at home with company. The call at four forty-five revealed the urgency to meet at Chuck's house in thirty minutes or miss the once-a-year event. Picking up the truck, grabbing a bite to eat, and travel time to Chuck's house took thirty-five minutes. An anxious Chuck awaited me in his cul-de-sac. We departed in his vehicle in a hurry. Having known Chuck for eight years at work I must say I was surprised to learn of his aggressive nature taking some of those turns on Angeles Crest highway. Come to find out this was a necessary evil in order to prevent getting locked out at the entrance. Don't get me wrong, I used to traverse these turns at high velocity on my Honda 929 (Chuck's note: The Honda 929 Fireblade is a 152 hp street racing motorcycle) four years ago. I actually enjoy that kind of thing. We, however, were limited on time. Indeed, we were the last ones to enter the gated private land surrounding the observatory. The scenery was beautiful; plenty of green trees everywhere.

Chuck's demeanor immediately changed. His angst was replaced with a jovial aura. People greeted him with respect as his inside jokes surfaced. He was like a third grader at recess. We unpacked items necessary for an eight hour stretch of telescope viewing: coffee. In addition, people brought trail mix, cookies, and various other pleasantries. But most important, everyone brought desire; a desire to learn, a desire to teach, and a desire to become intimate with distant celestial bodies through direct viewing. As I understand it, this sixty inch telescope is the second largest telescope in the world that enables direct viewing and is the largest one open to the public. (Chuck's note: today the 82 inch Otto Struve telescope at the McDonald Observatory in



Texas and the 100 inch at Mt. Wilson are open for public viewing). There are plenty of other larger and more modern telescopes out there, but they require technological intervention to recreate the image on a screen for instance. Evidently, somewhere between a sixty inch and one hundred inch reflective mirror exists the limit to which the human iris can interpret an image. Anything above that threshold yields a beam larger than the average iris size of seven millimeters. The people I spoke with that night generally agreed that they would rather the photons of light from the galaxies they're viewing go directly through the iris, stimulating receptors in the retina. As with every hobby, there are various levels of intensity. I was out there that night with the purists, and I think that added the element of right-brained mentality I seek in the Science community, but I so rarely find. As a result, I found discussions centering not only on left-brain mechanics and physical properties of stars, but discussions based solely on the intense beauty of the Cat's Eye Nebula for example (Chuck's note: there was a theory, now debunked, that the right side of the brain was the artistic, imagination, free spirit side and the left brain was the logical, science, math side). Of course, there is a reason for the beautifully colored ring around the focal point and that would spark a left-brained discussion concerning the nature of the hue. The balance was refreshing.

The heavens were awe inspiring. Whether you were peering through the massive four inch ocular piece or gazing with the naked eye through the observatory's opening, the feeling of humility was overwhelming. The vastness and order of galactic bodies nearly guarantees some sort of spiritual thought or discussion.

As I entered the observatory and hiked up two flights of metal steps the enormity of the telescope came into view. My mind was torn between analyzing the telescope's construction or the massive dome encompassing everything. Oddly enough, I elected to engage the dome. It is enabled to rotate about a central axis on actual train wheels atop a circular track. Above the wheels are trapezoid segments of dome. These segments diminish in size and become increasing angular with altitude until triangles are formed at the dome's apex. This reminded me of a previous trip to Rome; I was inside a modern version of the Pantheon.

After this revelation, I turned my attention to the telescope conspicuously looming overhead. With only a vague understanding of the design of a reflecting telescope, more questions arose than were answered, until later. I could clearly see two axes about which the telescope would rotate. The weight alone is impressive. I was told the main mirror is arguably the nearest to perfection in existence. The reverence to which the telescope was spoken of gave this giant a personality. I couldn't wait to get to know the beast. Instructions given by the docent were simple, "Stay away from the telescope when it is moving" and "Don't go near the train wheels when the dome is rotating." There were twenty-five or so chairs in an arc a few feet from the dome's wall creating a visible safety barrier. It would be a long night, so people brought their own chairs. Ironically, there was enough constant energy that that the chairs were rarely used. Chuck maintained an interest in answering any of my questions as well as seeing to it that I was having a good time. Aside from that, I found myself dropping in on other discussions in order to gain other viewpoints and knowledge basis. I was amazed at how much discussions revolved around historical events and people. From Carnegie's funding for the project to Hubble's work on Mount Wilson, there is a rich history waiting to be told.

END OF PART ONE



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NEXT Month A Night of Viewing

Chuck's final note: Matt, like myself is a Cardiovascular Perfusionist working as part of an open heart surgery team. As a Cardiovascular Perfusionist Matt has both an affinity for and an aptitude with all manner of mechanical equipment; so, he is naturally drawn to and fascinated by really big and complex equipment.

Cheers, Chuck

Another Look

By Dave Phelps

June 1 moon 2 days old, New moon June 29, full moon June 14

Strawberry Moon

Other native names are Berries Ripen Moon, Green Corn Moon, and Hot Moon. The Celtic names are Mead Moon, Horse Moon, Dyan Moon, and Rose Moon. Other English names are Flower Moon and Planting Moon.

I went with a troop of Boy Scouts to Calico Ghost Town some years ago back when it was owned by Knott's Berry Farm. We went to explore the town, have a camp out nearby and work on their Astronomy Merit Badge. What I remember most about the night was Polaris. The sky was so clear that its 9th magnitude companion was brilliant as were the ring of stars surrounding our North Star. The boys earned their badge successfully and I had a great time showing off bright double stars, nebulae, and galaxies.

Polaris has as long a history as any object in the sky. It has history in Greece, Mesopotamia, India, Southeast Asia, Australia, New Zealand and of course all over the Pacific Islands.

Polaris as a name was coined in the Renaissance, but our modern version of the constellation of Ursa Minor was first included in Ptolemy's Almagest.

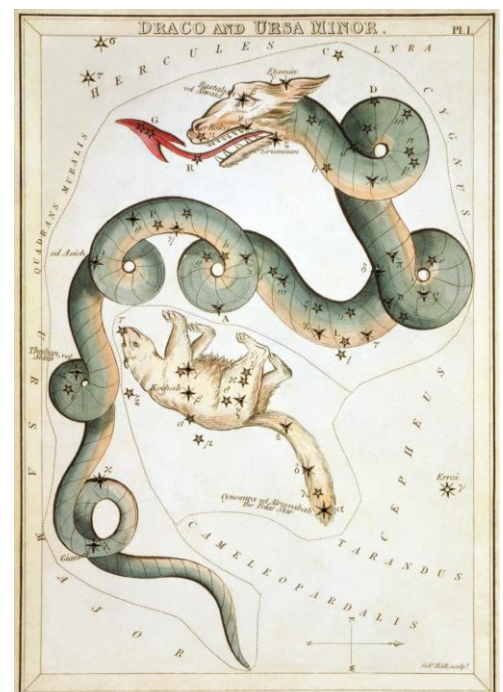
Scientifically speaking, Polaris is a Cepheid variable. Near it, Beta β Ursa Minoris, named Kochab, is an orange giant that has fallen off the main sequence. It also has a planet orbiting it. Three other stars in Ursa Minor also have planets.

There are not too many deep sky objects in Ursa Minor. The only one I've looked for is NGC 6217, because it's listed as a starburst galaxy and I was looking for those bright knots in the spiral arms.

Wrapping around Ursa Minor is Draco. There are three main stories about Draco that have come down through the years. In one the Greeks have him fighting the gods and losing. Athena throws him into the sky in retaliation and he ends up twisting around himself.

Eratosthenes depicted Draco as Ladon, the dragon the goddess Hera tasked with guarding the golden apples of the Hesperides, who are nymphs of the evening or maybe sunset. Hercules defeated Ladon when he went to steal the apples. Hera honored his service by placing him into the heavens after Hercules killed him.

Tangentially, I have a theory. Suppose the golden apples were oranges, maybe a little easier to grow in the climate around Turkey at that time. Imagine Hercules as those ancient mariners who skipped along the islands in the Aegean exploring the world and investigating new lands and ports-a-call. They planned to steal



orange trees and then return home in one piece. Perhaps Draco is the Bosphorus and the Dardanelles, two extremely twisted and narrow waterways guarding Turkey on the north and the south. Be they thieves, smugglers or traders, it was ancient free enterprise at its finest.

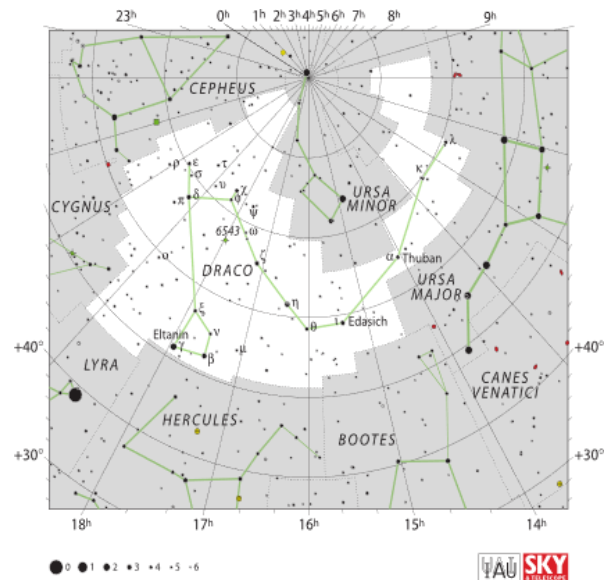
Although the Arabs knew the Greek description of Draco as a serpent, the Arabic theme for this constellation was a herd of camels. The stars Beta β (Alwaid), Gamma γ (Etamin), Nu ν (Kuma) and Xi χ , (Grumium) in the Head of the Dragon represent four mother camels protecting a baby camel from the attack of two hyenas, (Eta η and Zeta ζ (Nodus 1). The nomad's camp located nearby (the three unnamed stars in the neck of the Dragon: Epsilon ϵ , Tau τ , and Sigma σ). **Nodus 1 –**

Constellations of Word

There are a couple of interesting objects in Draco. Right next to Omega ω is Gliese 687. Gliese was a German astronomer whose first catalog was of nearby stars within 20 parsecs. There have been two subsequent editions since extending the distance out to 25 parsecs. G687 is small, red and 9th magnitude. It seems to be sitting right on top of Omega ω . If you center Ω in your telrad, G687 will be at about PA 180 near the inner ring. G 687 also has two planets that are Uranus size (?) that you won't see. Close to G687 is the North Ecliptic Pole. The NEP is of interest because NGC 6543, the Cat's Eye nebula, is sitting almost right on top of it.

Some awfully spectacular images of the Cat's Eye have been made but I have only seen a bluish-greenish blob. They tell me the core is 20" across, but maybe the right filtering on a bigger telescope will bring out some of the outer shell.

A last image to look at in Draco this month is up by M81/M82. NGC 3147 is a nice 10th magnitude face on spiral about 4' across. It's been cataloged as a Seyfert galaxy with an active nucleus. I don't remember any details about it, but the pictures show me a bright, condensed nucleus. Any takers? If you click on the hyperlink above, you will get a larger chart of Draco.



https://upload.wikimedia.org/wikipedia/commons/b/b6/Draco_IAU.svg

“The Pyramids on the Giza Plateau were designed to have one side facing north, with an entrance passage geometrically aligned so that Thuban or Draconis would be visible at night.

At the time the Great Pyramid was built, one of the shafts aimed toward the star that was then closest to the north celestial pole. The other aimed at the Belt of Orion, one of the brightest and most impressive constellations.

The Egyptians described these stars as "imperishable" or "undying." The pharaoh of the time expected that when he died, he would join not only with the Sun, but with Thuban as well - maintaining order in the celestial

realm, just as he had on Earth.”

<https://www.gshpa.org/content/dam/girlscouts-gshpa/documents/girl-scouts-at-home/constellation-discovery/Draco.pdf>

Not all scientists and archaeologists agree with that last passage. It does seem a little complex. For an alternative discussion click on the hyperlink to an article from Astronomy Magazine:

[*Are the Egyptian pyramids aligned with the stars? - Astronomy ...*](#)

Back in the second century, Ptolemy compiled his Almagest of 48 constellations. Ptolemy lived in Alexandria, about 31 degrees north latitude, just a little lower than Southern California. How did he compile all the stars of and name the constellation of the Centaur? Was he far enough south? Still the Almagest was the Astronomy reference up till and past the time of Copernicus.

[*\(Kentauren 1602 - Skoklosters slott - 102438.gif \(1200x996\) \(universetoday.com\)*](#)

Sometime, back in the 80's during early spring around midnight I took my binoculars to Black Star Canyon Road to check out the seeing. I had forever been searching the Thomas Guides for back roads that might lead me to close-in observing sites. Considering I was in the middle of the Orange County light dome, the seeing was pretty good and the sky darkness also pretty okay. I remember this evening because it got so cold that the dew froze on my windshield but mostly because I saw Omega Centauri and Centaurus A in the same field. My binoculars are an old pair of Tasco wide field 7x50's that I picked up back in the 60's. What impressed me most about them was that I could see the entire constellation of Lyra in my eyepiece. So, now it's your turn.



Centaurus, as depicted on a globe created by Gullielmus Janssonius Blaeu (1602), photographed at Skokloster Castle in Stockholm, Sweden. Credit: Wikipedia Commons/Erik Lernerstål Thank you universetoday.com

Cataloged by Bayer as a star and visible to us at 4th magnitude, Omega is claimed by Burnham and echoed by Herschel and others to be the finest Globular Cluster in the sky. It has been written about and studied extensively with descriptions of its large population of RR Lyrae variables used to determine its distance and its own H-R Diagram to map its stellar population. Omega is low to the southern horizon for us, rising to about 10 degrees at its highest. Near the end of June, it will transit between 9 and 10 pm.

About 5 degrees north of Omega and in the same binocular field is 6th magnitude Centaurus A, disrespectfully called the Hamburger Galaxy, also number 77 on Patrick Caldwell's list and listed as NGC 5128.

Lots has been written about it but most recently it seems that it's an elliptical that has undergone or is undergoing a collision with another galaxy. Details aside it is a magnificent object to observe and along with its companion are challengers for nearest spectacular celestial companions.

[**APOD: 2022 March 17 – Centaurus A \(nasa.gov\)**](#)
Image Credit & Copyright: David Alemazkour

Centaurus is no slug in the galaxy department either. Abell 3526, the Centaurus galaxy cluster has hundreds of galaxies of all types and sizes. The brightest member of the cluster, I think, is NGC 4696 an 11th magnitude but if you want a bit of a challenge and maybe a telescope with a few extra inches look for NGC 4622, a 12-13th magnitude RING galaxy not too distant from N4696. It is round at 2'x2'; now that you know what to look for, perhaps you will glimpse the ring. Check out **APOD**, they have terrific images.

I've never been to the Winter Star Party on the Florida Keys, nor to Cabo San Lucas in Baja California. However, if I ever get down there, the first thing I will look at is the Southern Cross. The first thing I will point my telescope at is Alpha α Centauri. Alpha is, as you know, a multiple star system that is closest to us. Alpha's name is Rigel Kentaurus meaning foot or hoof of the Centaur. Alpha Centauri B's name is Toliman. Derived from the Arabic the meaning is "the two male Ostriches" This makes a little more sense when we realize that the original name for both stars was Toliman. A very closely matched small telescopic double, Rigel Kentaurus came later. The third member, as you know, is Proxima and is determined to be the closest to us of the three stars. A, B, and C Centauri are gravitationally bound. At 0 and 1 magnitude A and B are about 8' of arc apart per Burnham, so easily split. Proxima, however, is 2 degrees from the two and 11th magnitude, easy to spot in your 12 inch but harder to identify.

As long as we're looking at doubles from the tip of Baja, lets look at Beta β Centauri, Hadar. Hadar has a multitude of meanings from knee to spear carrier. It forms a largish double with Alpha some 4.5 degrees distant. Hadar is also a multiple star system whose 4th magnitude companion is probably too close for anything but professional instruments at this moment in its orbit. Of historical significance, Alpha and Beta were instrumental as navigation stars to the south pacific islanders whose ocean travel between islands in dugout canoes is the stuff of legends.

Bootes is an ancient constellation with mythic references to the Greek gods Zeus and Callisto to the more modern interpretation of a plowman. His nearness to Ursa Major adds to his story. In England and many other countries, the Big Dipper is not a bear but a plow. Ergo, the Plowman and the Plow.

The Greek story about Bootes is not only a little gory but complicated by alternative references. In brief, Callisto was the mother of Arcas, the ancient name for the constellation. Arcas was famed as a hunter, his mother, Callisto, was changed into a bear by one of the gods, either Hera or Artemis, and there we have a hunter holding a spear chasing a bear around the heavens for eternity. There are references that go as far back as Mesopotamia depicting Bootes as a hunter. Ptolemy settled on a Herdsman in his *Almagest* using the name Bootes, whose meaning is derived from older words meaning Herdsman or Plowman. The stars in Bootes lend flavor to the legend. Arcturus is old, its name going back to 700 BCE. Originally they think it meant



Boötes as depicted in Uranis's Mirror a set of constellation cards published in London c.1825. In his left hand he holds his hunting dogs, Canes Venatici. Below them is the constellation Coma Berenices. Above the head of Boötes is Quadrans Muralis, now obsolete, but which lives on as the name of the early January Quadratic meteor shower. Mons Maenalus can be seen at his feet. Copied from Wikipedia.org

<https://en.wikipedia.org/wiki/Bo%C3%B6tes>



Temecula Valley Astronomer

The monthly newsletter of the Temecula Valley Astronomers June 2022

Guardian, the bear added later to the story. The next star up to the left is 2nd magnitude Izar, Epsilon ϵ Bootis. Epsilon is a double star system with some interesting science. It is also one of the finest telescopic binaries in the sky. The separate magnitudes are 2nd and 5th and they are separated by 3" of arc. Epsilon A is bright orangeish or yellowish and its companion blue, though the colors are subtle. Back in the 19th century Friedrich Struve named Izar "Pulcherrima", Latin for "the loveliest". Currently we translate Izar as "guardian" though it is likely that its name is also derived from the same root as Mizar in Ursa Major, meaning the thigh, loin, or rider.

Up at the right hand of Bootes is the star Alkalurops, mu μ Bootis. Alkalurops' meaning is derived from shepherd's crook or staff, though in the *Urania's Mirror* image above it is the hand holding the leashes of Canis Venatici. Mu is a double double system bright enough to see but narrow enough to need some mirror size to split.

Moving away from doubles, NGC 5248 is a cool galaxy located about as far south as you can get and still be in Bootes; very near Virgo. It's a 6' oval, 10th but nearly 11th magnitude and considered to be a member of the Virgo Cluster. I've seen terrific images of it, but I don't think I've ever searched for it. NGC 5248 is also Caldwell 45.

NGC 5466 is also a very interesting character. It is a 10th magnitude globular of class XII, which means it has no apparent central condensation. NGC 5466 is largish at 11', somewhat larger than the apparent size of the crater Tycho at 7'. Still, it will be a little bit of a challenge because the light of the stars is so spread out.

If we move almost as far north into Bootes as we can, we will find our last faint and fuzzy. I chose NGC 5820 because of its extreme nature, much like NGC 5466. NGC 5820 is a class S0 lenticular galaxy. Meaning, I am told, that it is halfway from and elliptical to a spiral galaxy. It appears edge on with no arms or dark band. It'll be tough, Wikipedia gives its magnitude at 11.98. But, as a bonus, you may be able to pick out NGC 5821 in the same field.

Dark Skies, Dave Phelps



Solstice Shadows

By David Prosper – NASA - JPL

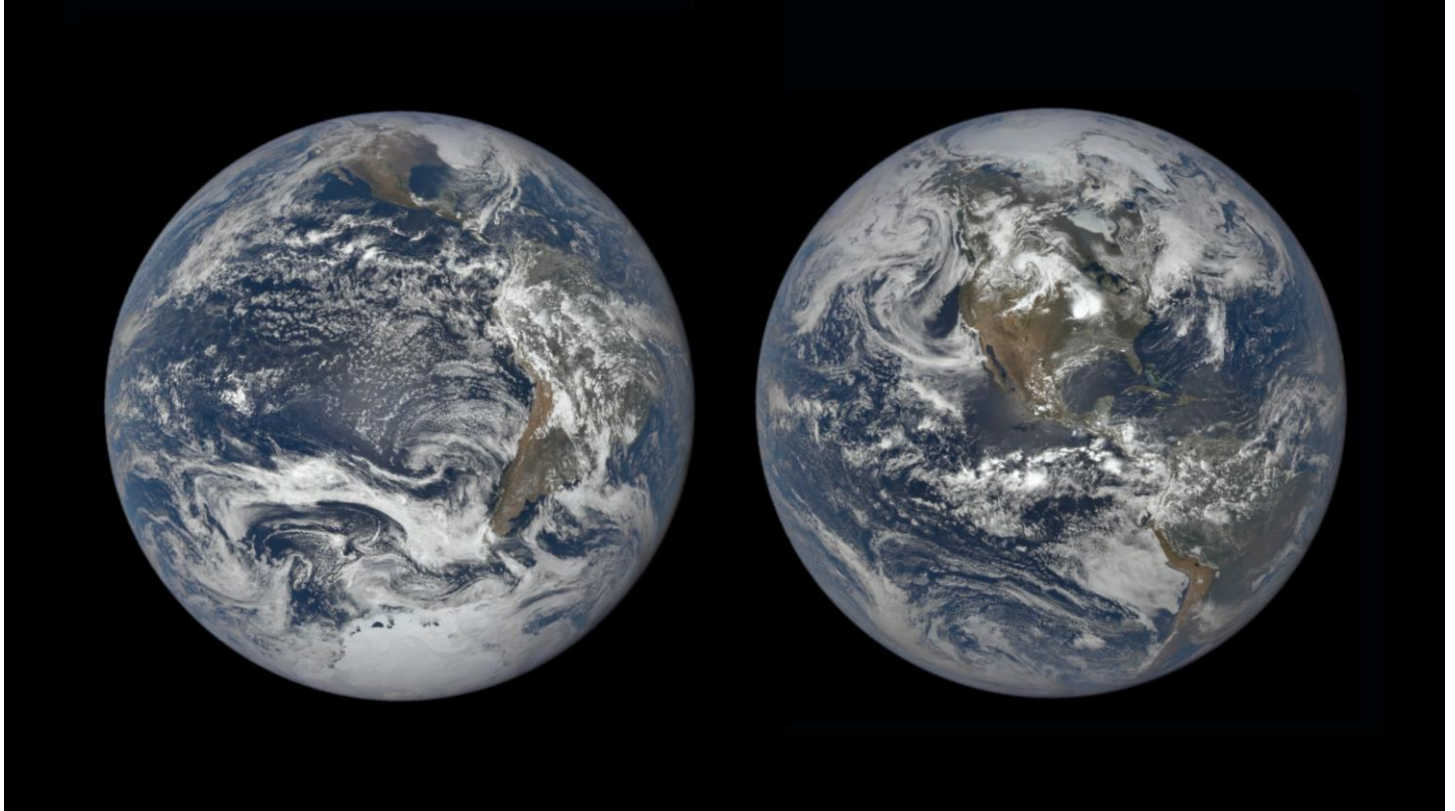
Solstices mark the changing of seasons, occur twice a year, and feature the year's shortest and longest daylight hours - depending on your hemisphere. These extremes in the length of day and night make solstice days more noticeable to many observers than the subtle equality of day and night experienced during equinoxes. Solstices were some of our earliest astronomical observations, celebrated throughout history via many summer and winter celebrations.

Solstices occur twice yearly, and in 2022 they arrive on June 21 at 2:13 am PDT (9:13 UTC), and December 21 at 1:48pm PST (21:48 UTC). The June solstice marks the moment when the Sun is at its northernmost position in relation to Earth's equator, and the December solstice marks its southernmost position. The summer solstice occurs on the day when the Sun reaches its highest point at solar noon for regions outside of the tropics, and those observers experience the longest amount of daylight for the year. Conversely, during the winter solstice, the Sun is at its lowest point at solar noon for the year and observers outside of the tropics experience the least amount of daylight- and the longest night – of the year. The June solstice marks the beginning of summer for folks in the Northern Hemisphere and winter for Southern Hemisphere folks, and in December the opposite is true, as a result of the tilt of Earth's axis of rotation. For example, this means that the Northern Hemisphere receives more direct light from the Sun than the Southern Hemisphere during the June solstice. Earth's tilt is enough that northern polar regions experience 24-hour sunlight during the June solstice, while southern polar regions experience 24-hour night, deep in Earth's shadow. That same tilt means that the Earth's polar regions also experience a reversal of light and shadow half a year later in December, with 24 hours of night in the north and 24 hours of daylight in the south. Depending on how close you are to the poles, these extreme lighting conditions can last for many months, their duration deepening the closer you are to the poles.

While solstice days are very noticeable to observers in mid to high latitudes, that's not the case for observers in the tropics - areas of Earth found between the Tropic of Cancer and the Tropic of Capricorn. Instead, individuals experience two "zero shadow" days per year. On these days, with the sun directly overhead at solar noon, objects cast a minimal shadow compared to the rest of the year. If you want to see your own shadow at that moment, you have to jump! The exact date for zero shadow days depends on latitude; observers on the Tropic of Cancer (23.5° north of the equator) experience a zero shadow day on the June solstice, and observers on the Tropic of Capricorn (23.5° south of the equator) get their zero shadow day on December's solstice. Observers on the equator experience two zero shadow days, being exactly in between these two lines of latitude; equatorial zero shadow days fall on the March and September equinoxes.

There is some serious science that can be done by carefully observing solstice shadows. In approximately 200 BC, Eratosthenes is said to have observed sunlight shining straight down the shaft of a well during high noon on the solstice, near the modern-day Egyptian city of Aswan. Inspired, he compared measurements of solstice shadows between that location and measurements taken north, in the city of Alexandria. By calculating the difference in the lengths of these shadows, along with the distance between the two cities, Eratosthenes calculated a rough early estimate for the circumference of Earth – and also provided further evidence that the Earth is a sphere!

Are you having difficulty visualizing solstice lighting and geometry? You can build a “Suntrack” model that helps demonstrate the path the Sun takes through the sky during the seasons; find instructions at stanford.io/3FY4mBm. You can find more fun activities and resources like this model on NASA Wavelength: science.nasa.gov/learners/wavelength. And of course, discover the latest NASA science at nasa.gov.



These images from NASA's DSCOVR mission shows the Sun-facing side of Earth during the December 2018 solstice (left) and June 2019 solstice (right). Notice how much of each hemisphere is visible in each photo; December's solstice heavily favors the Southern Hemisphere and shows all of South America and much of Antarctica and the South Pole, but only some of North America. June's solstice, in contrast, heavily favors the Northern Hemisphere and shows the North Pole and the entirety of North America, but only some of South America.

Credit: NASA/DSCOVR EPIC Source: <https://www.nasa.gov/image-feature/goddard/2021/summer-solstice-in-the-northern-hemisphere>



A presenter from the San Antonio Astronomy Club in Puerto Rico demonstrating some Earth-Sun geometry to a group during a “Zero Shadow Day” event. As Puerto Rico lies a few degrees south of the Tropic of Cancer, their two zero shadow days arrive just a few weeks before and after the June solstice. Globes are a handy and practical way to help visualize solstices and equinoxes for large outdoor groups, especially outdoors during sunny days!

Credit & Source: Juan Velázquez / San Antonio Astronomy Club



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