nightwatch
Newsletter of the Pomona Valley Amateur Astronomers

It is no good to try to stop knowledge from going forward.
Ignorance is never better than knowledge.
Enrico Fermi

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Volume 44 Number 4 ***nightwatch*** **April 2024**

President's Message

It's a great season for stargazing, when the clouds cooperate. We're far enough into spring to be losing the winter constellations in the autumn twilight, although there's still plenty to see in Monoceros, Gemini, and Auriga. It's prime time for galaxy-hunting, with the galaxy fields of Coma Berenices and Virgo high overhead. And for the night owls, the summer constellations of Scorpius, Lyra, and Cygnus are over the eastern horizon by midnight.

Our meeting this month is eclipse-themed. For a small club, we had members all over the place to observe the solar eclipse on April 8, from cruise ships on the Pacific Ocean, to observing sites across Texas, to the Midwest. We'll take turns sharing our stories and our photos at this Friday's general meeting. We'll lead off with Ken Elchert, who traveled to his home town – and that of moonwalker Neil Armstrong – of Wapakoneta, Ohio, to observe the eclipse. It'll be a great meeting, and I hope to see you there.

Matt Wedel

Club Events Calendar

Apr 26	**General Meeting 7:30 PM**
May 4	**Star Party – Cow Canyon**
May 8	**Board Meeting 6:15 PM**
May 17	**General Meeting 7:30 PM Denise Kaisler**
Jun 8	**Star Party – TBD**
Jun 12	**Board Meeting 6:15 PM**
Jun 21	**General Meeting 7:30 PM**
July 10	**Board Meeting 6:15 PM**
July 19	**General Meeting 7:30 PM**
July 27	**Star Party – TBD**
Aug 7	**Board Meeting**
Aug 16	**General Meeting 7:30 PM**
Aug 31	**Star Party – TBD**
Sept 11	**Board Meeting**
Sep 20	**General Meeting 7:30 PM**
Sept 28	**Star Party – TBD**
Oct 9	**Board Meeting 6:15 PM**
Oct 12	**Star Party – Cahuilla Park**
Oct 18	**General Meeting 7:30 PM**
Nov 2	**Star Party – TBD**
Nov 6	**Board Meeting 6:15 PM**
Nov 15	**General Meeting 7:30 PM**
Nov 27	**Board Meeting 6:15 PM**
Dec 7	**Holiday Party**

PVAA General Meeting 03/22/2024

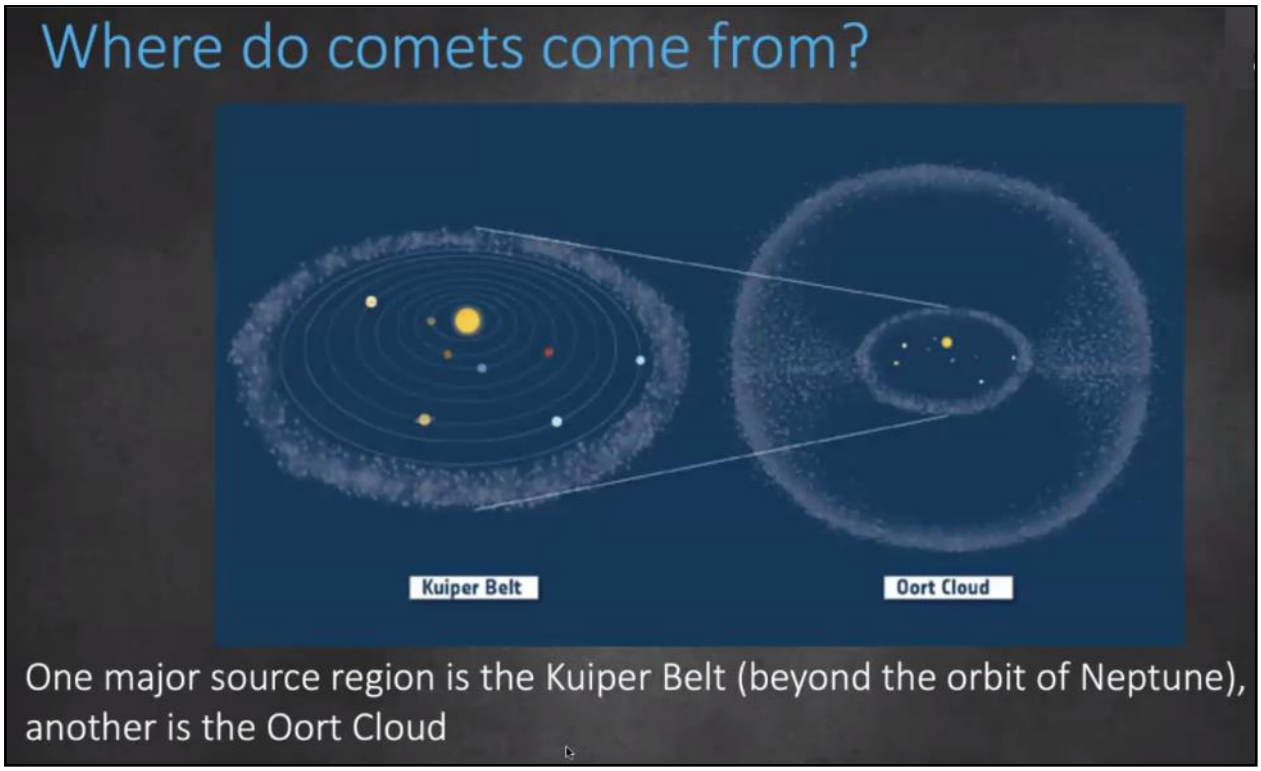
We started the meeting asking for nominations for Club secretary, and other offices of the Club board. Dues are also due.

We then had a presentation on the SpaceX ITF-3 (Integrated Flight Test #3) of its Starship rocket. While it did not meet every goal, it was much more successful than the previous two flight tests. It successfully transferred cryogenic fuel from one internal tank to another while in space for the first time in history. It showed live for the first-time plasma build up around the rocket during re-entry. The second stage Starship was lost on its return to Earth at an altitude of about 65 kilometers or 40 miles. This is believed to be because of a roll of the Starship, putting the parts of the spacecraft without heat tiles into the plasma of re-entry. Starship was designed to lift more than the Saturn V into orbit and to the moon, with a lift-off thrust of 16.7 million pounds.

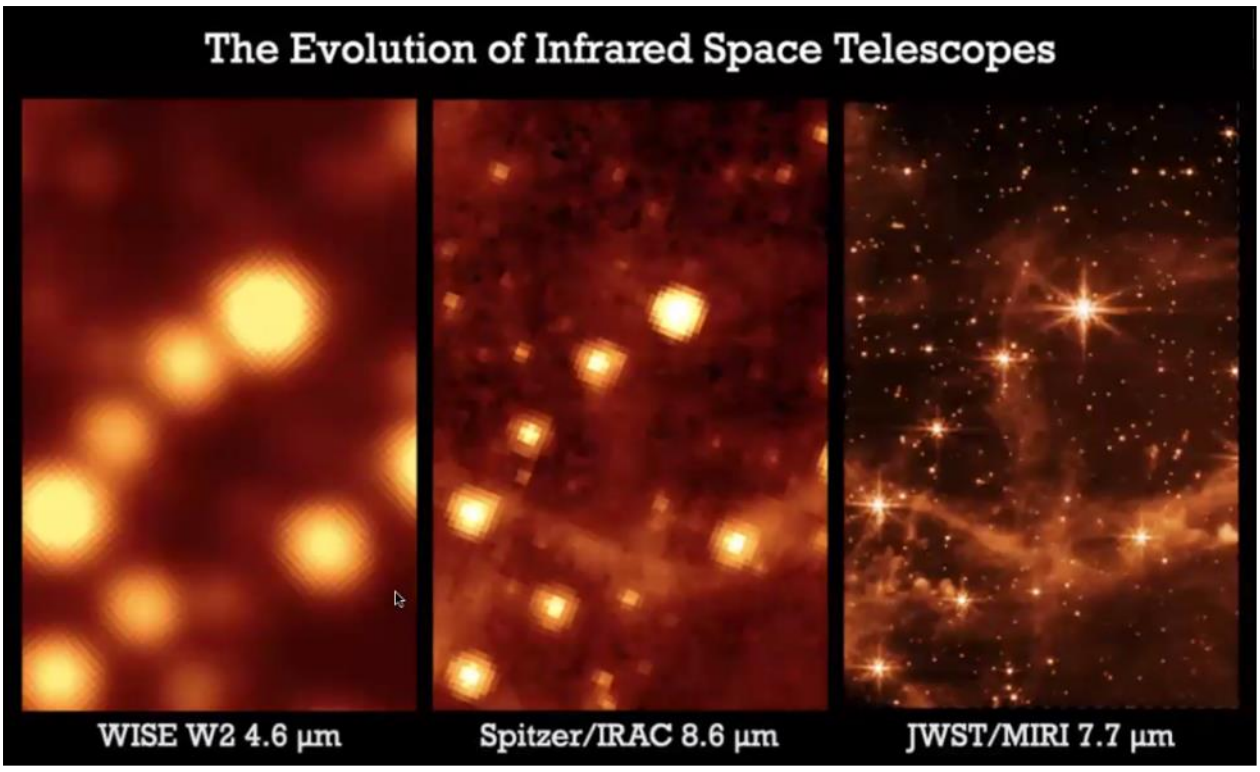
After a short break we had a presentation by David G. Milewski from UCLA, on his ongoing research on comets. David asked, 'What are comets?' and defined them as chunks of ice, gases, dust and often water, encased in carbon that orbit the sun on a highly elliptical path. Some comets orbit in as little as 5 to 20 years, while others take over 200 years to orbit the sun. Usually, you can see two tails from the comet when it approaches the sun. The ion tail always points away from the sun, while the slightly curved & brighter dust tail flows out in a path between the comet's orbital path and the ion trail.

Size comparison of comet 67P versus Los Angeles.

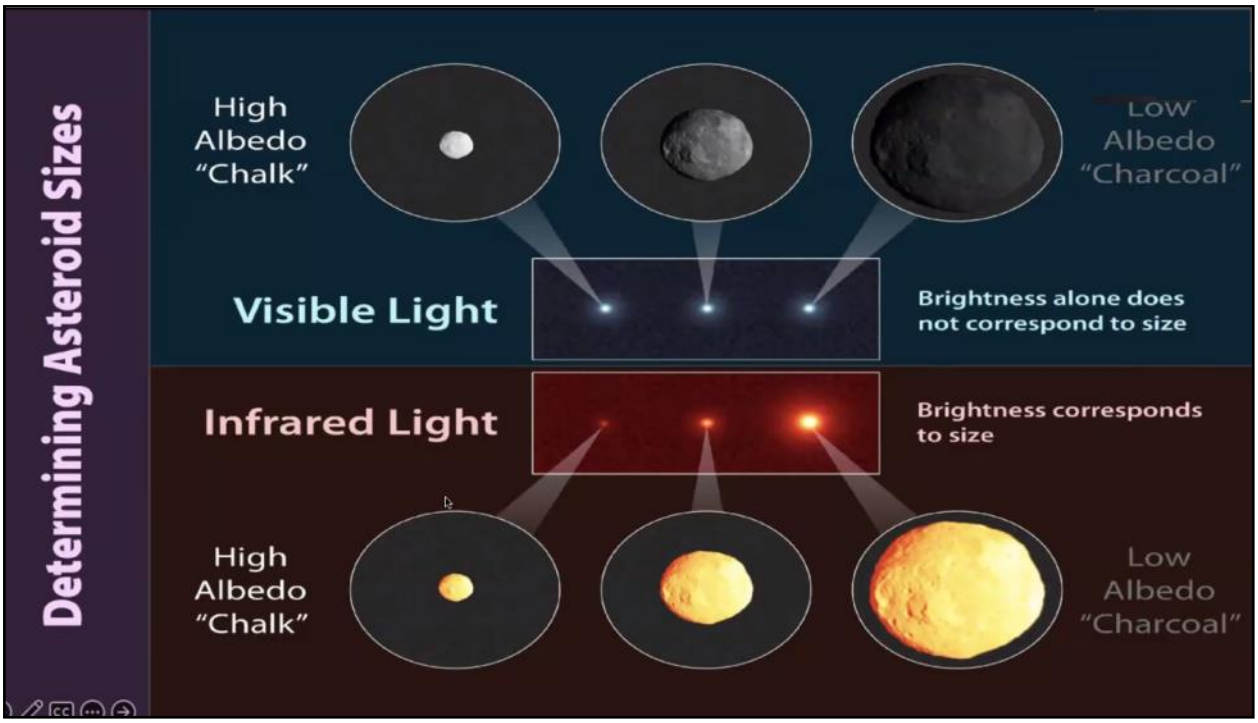
So why do we care about comets? Comets may contain pristine materials from the original formation of our solar system. Comets may be responsible for delivering the building blocks of life to Earth, and death via impacts, mass extinctions.



Where do comets come from? The two major sources are the Kuiper Belt beyond the orbit of Neptune, and the other is the Oort Cloud. Their 'arrival' in the sky has been associated with omens, good and bad fortunes, disaster, the apocalypse, and pending doom. Edmond Halley was the first to predict the return of a comet. That is why that comet is named after him.



The NASA WISE (Wide-Field Infrared Survey Explorer) spacecraft was launched in 2009 to study the 3.4, 4.6, 12 and 22 micrometer wavelengths. It was re-named NEOWISE after re-activation in 2013 and put into hibernation in 2011, after depletion of its solid hydrogen coolant. The added NEO to the name stands for Near-Earth Objects. It is now focusing on comets and asteroids that could collide with Earth and is expected to continue operation until 2025 and then re-enter the atmosphere. It is currently in its 11th year of the reactivated mission.



David then talked about the 'albedo' of an object depending on the size and color or reflect ability of an object. An object made of white chalk will reflect more light than a larger object made of charcoal. He also brought up the concept of a 'Frost Line,' where liquid water cannot exist without something to heat it up. That would be 3-4 astronomical units from the Sun. If a comet has a tail farther out than that, it cannot be water, it must be CO and/or CO_2 with dust. Comets undergo rapid evolution in as little as the average human lifetime. We are just now able to measure the amounts of gasses and dust expelled.

Gary Thompson

Comet 12P/Pons-Brooks from NASA's Astronomy Picture of The Day

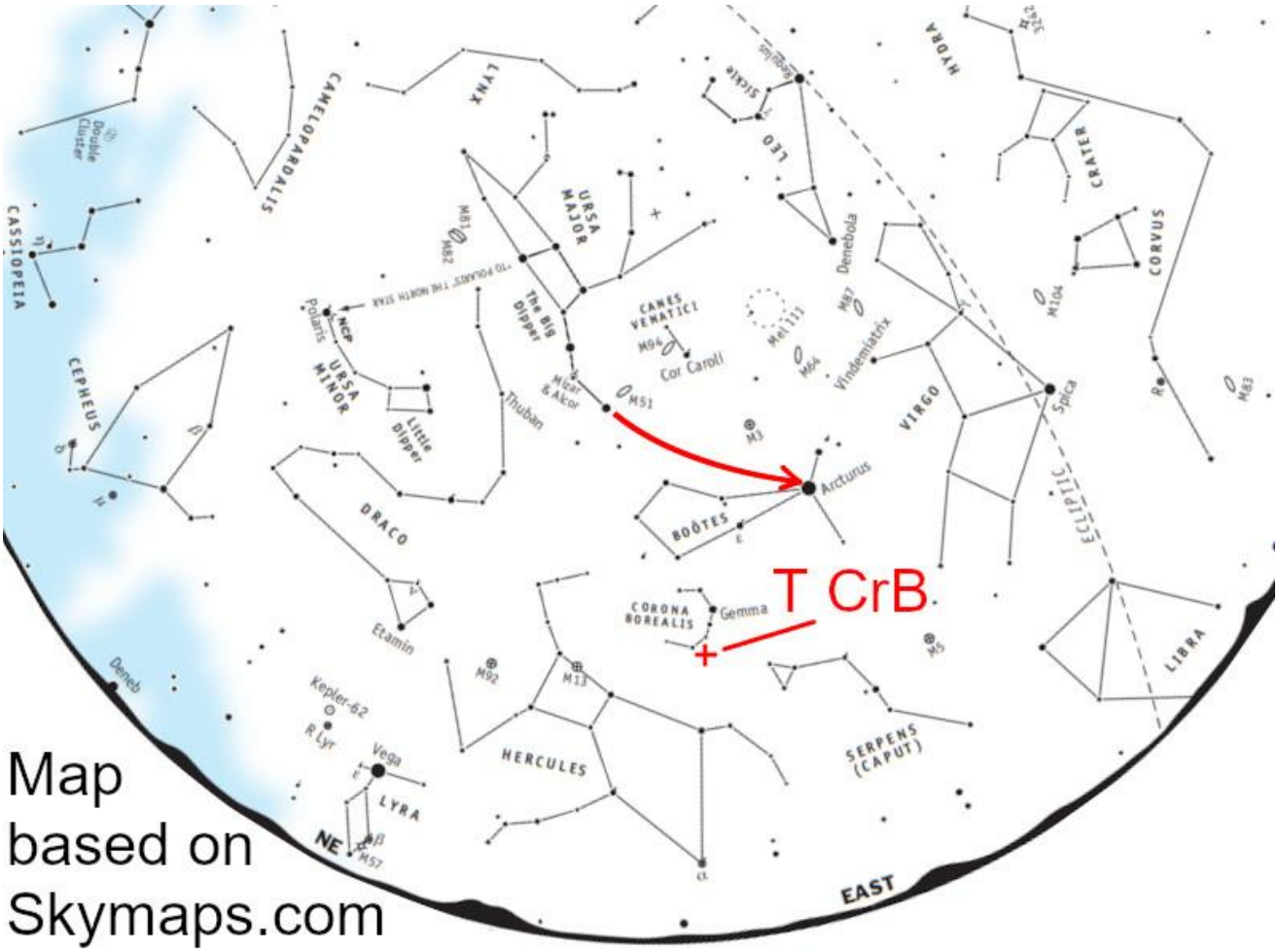
Coming up soon – the recurrent nova T Coronae Borealis

Now that the solar eclipse is behind us, the next big event in the sky should be the outburst of T Coronae Borealis. T CrB is a recurrent nova, a binary star system in which material from a red giant star is gravitationally siphoned into an accretion disk around a white dwarf companion. Eventually material from the accretion disk is heated to the point that it undergoes runaway fusion. That "eruption" causes the whole system to become more than a thousand times brighter.

Of the ten recurrent novae known to exist in the Milky Way, T CrB is by far the brightest. Normally T CrB has a magnitude of 10, putting it in reach of binoculars, but it can flare up to magnitude 2 or 3, making it easily naked-eye visible. By comparison, Alphecca, normally the brightest star in Corona Borealis, shines at magnitude 2.2, so T CrB may get about that bright, or even slightly brighter. The two most recent flares by T CrB were in 1866 and 1946, suggesting a period of about 80 years. Recent fluctuations in the light curve of T CrB mimic those in the year before the 1946 outburst, and astronomers predict that T CrB will erupt again between now and September.

To find T CrB, find the Big Dipper and follow the line of the handle along the "Arc to Arcturus". A little north and east of Arcturus you'll find the crown shape of Corona Borealis. T CrB is lurking just off the eastern edge of the crown. We'll keep an eye on things and send out an alert to the club when it flares up, and then you'd best not wait -- after it erupts, T CrB can drop 3 magnitudes in a week, so it will only be a celestial standout for a few nights at most. See the adjacent sky map, modified from The Evening Sky Map, which is a free download at Skymaps.com.

Matt Wedel

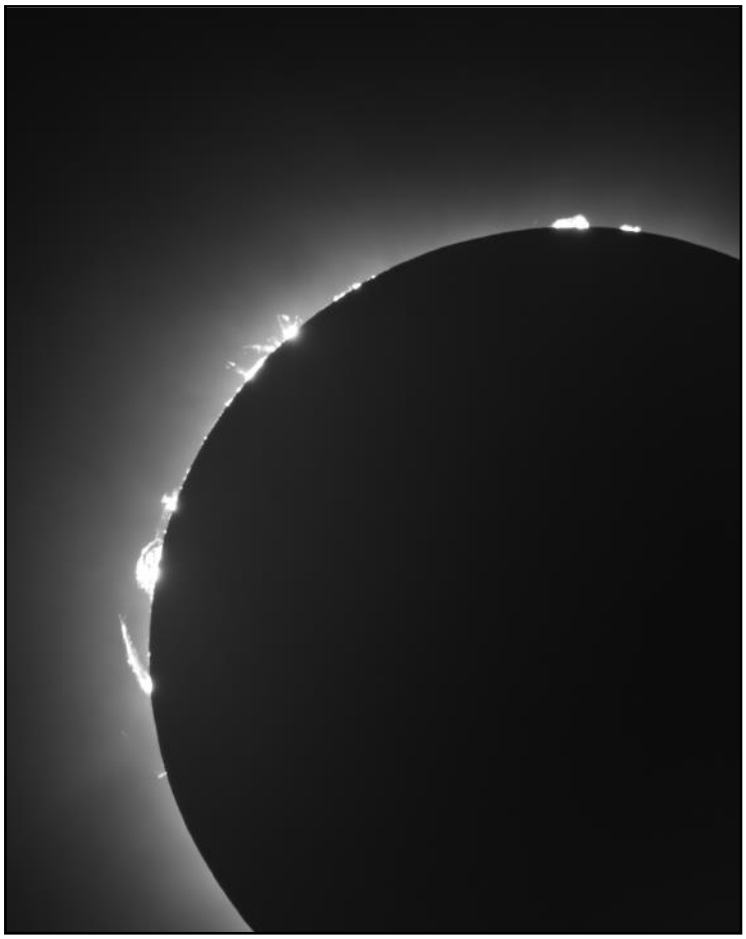


Eclipse

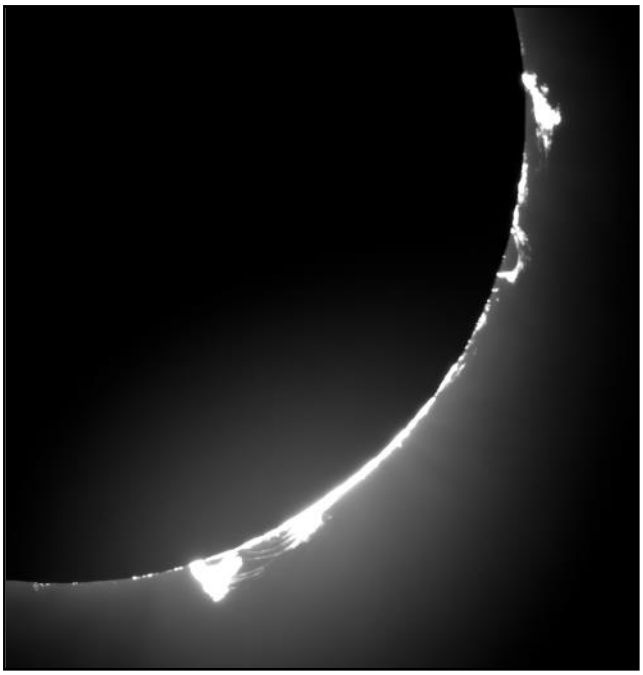
New moon was April 8, and what a new moon it was!! Normally, we travel to a dark site for new moon, but not this time. We traveled to Round Rock, Texas to visit a former grad school colleague of Cindy's and mine; and hoping for clear skies to see the total solar eclipse. The next one in the US won't be until 2044! If you missed it, I hope these pictures make up for it.

Weather heading into eclipse day was not looking great, although one or two of the many forecasts I looked at were predicting clear-ish! The evening of the 7th was clear enough to get two setups polar aligned. Chalk marks were placed on the pavement so that the following morning simply placing the rigs in the same position would be close enough that frequent recentering of the sun wouldn't be necessary. The morning of the 8th arrived with weather that really didn't look amenable to viewing the eclipse. A call from a friend camped out at Burnet, Texas, about an hour away, convinced us all to head out that way for a better chance for clearer skies.

Surprisingly, the roads were not crowded and we arrived with plenty of time to get set up and aligned. My telescopic set up was well enough aligned that no recentering was needed during the eclipse and the tracker with the Canon DSLR only needed occasional recentering. This allowed both set ups to automatically capture the eclipse while I could enjoy the spectacular display visually. Both set ups worked well throughout totality, but the computer for the telescopic setup hung up about 15 minutes into the post-totality, partial phase of the eclipse. The DSLR setup clicked away flawlessly. Both setups were taking 3 bracketed pictures every minute before and after totality. 10 seconds before and after second and third contact a 1/1000s exposure image was taken every second. During totality, each setup looped through 13 frames of exposures ranging from 1/1000 to 4 seconds. But, because I moved locations, the exact timing of first, second, third, and fourth contact was slightly off and I missed imaging most of second contact.



The first two images are at second and third contact showing the prominences at each edge. For reference, first contact is when the moon first begins to cover the sun and a partial eclipse begins. Second contact occurs when the leading edge of the moon touches the far edge of the sun and marks the beginning of totality. Third contact occurs when the trailing edge of the moon starts to uncover the sun and marks the end of totality. Finally, fourth contact occurs when the moon exits the sun and marks the end of the eclipse. These first images were taken with the StellarVue telescope using a Thousand Oaks solar filter and an H-alpha filter combined, and apparently even the shortest exposure time was too long as the prominences are blown out. These exposures were both 1/60s. However, one positive of being over exposed is that the bridges between the prominences, especially at third contact, are visible.



The next three images are during totality. First is a so-called Diamond Ring phase, which technically is just before or after totality. A very small sliver of the sun is still uncovered but the sliver is not so bright so that some of the corona is showing, resulting in seeing the corona (the ring) and the bright sliver (the diamond) at the same time. This image was a 1/1000s exposure at f/8 and 250mm focal length from my Canon 80D without a solar filter. The second image is taken just as the moon completely covers the sun and I think shows Bailey's Beads. Just as the moon covers the sun, some of the sun shines between mountain peaks on the moon forming disconnected bright spots which are the beads. The image was taken under the same conditions as the Diamond Ring. The final image is an HDR version of the corona. This is during complete totality and is a composite of 6 images taken at equal exposure steps ranging from 1/1000 seconds to 1/30 seconds at f/8 and 250mm focal length. This final image was processed in PixInsight and final stretching and HDR processing was done in Photoshop.

I hope these images convey the incredible sense of awe that is a total solar eclipse. I have to admit that this is probably the most surreal-looking real event I've ever seen! I'm seriously considering traveling to view one of the next ones in 2026 or 2028 and would highly encourage everyone to view at least one in their lifetime.

Clear skies until next month.

Ron Ugolick

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

Another Look
May 2024 Draco

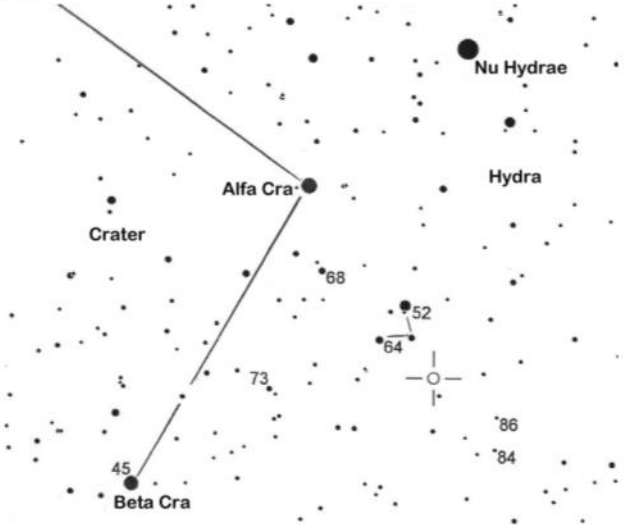
May 3, waning crescent, moon occults Saturn. 1.5 deg apart, in So Ca and Arizona it is a pre-sunrise event
May 4 waning crescent moon occults Mars, in So Ca and Arizona they are very close at sunrise
On May 31 the moon occults Saturn and Neptune. Both have a very close approach in the AM. The Saturn occultation will be visible from Tierra del Fuego and Neptune's from Cape Town.

The New moon in May is on the 7th at 2023 PDT The Full moon in May is on the 23rd at 0653 PDT
In Spanish the New Moon is Mayo Luna Ilena, in German Vollmond im Mai, in Latin Maii Plenam Lunam, in Italian Luna Piena di Maggio, in French Pleine Lune de Mai, in Ukrainian Травневий Новний Місяць- Travnevyy Povnyy Misyats' and in Greek Πανσέληνος Μαΐου, Spansélinos Maΐou

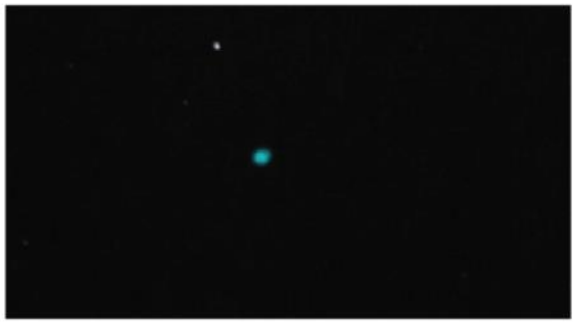
Lots of early morning stuff to see. On May 9, Mercury is at greatest western elongation, on the 13th, Mercury is at its highest in the morning sky, and on the 14th Mercury is at dichotomy. (half moon shape). On May 18 Jupiter is at solar conjunction

Latin Dragon, Spanish Dragòn,
French Dragon, German Drache,
Greek δράκων drakōn, Italian Drago
Meteors this month are the Eta Aquarids. They range from April 15 thru to May 27, peaking at May 05, around 0400.
The moon will be 26 days old, so should not be too great a hindrance.

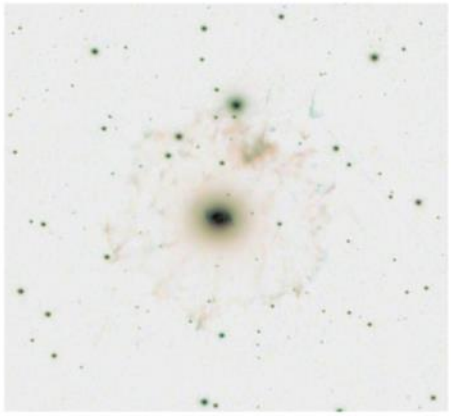
Variable star this month is V Hydrae
https://www.aavso.org/featured-variables



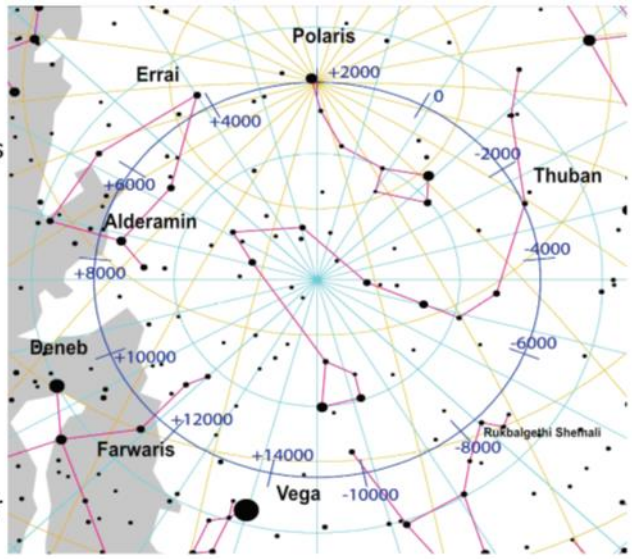
"You are all poets." I told a gathering of amateur astronomers at the 1983 annual Texas Star Party. At first they reacted with silence. Then they began to agree. The common thread that binds amateurs together is a love of the grandeur and beauty of the starry deeps. While some may claim it's the science of astronomy that interest them. I believe that deep down it is the ultimate experience of the night sky that hold the real attraction.
"Deep Sky Wonders" Walter Scott Houston published in "Sky and Telescope" magazine.
https://www.meredithdillman.com/art-shop/draco-constellation-art-print



When Scotty wrote this, it was a preamble to a column on NGC 6543, the "Cat's Eye Nebula".
Scotty went on to talk about its appearance in everything from a 1" homemade refractor to a 4" Clark to a 20" Dob and even to the 60" at Mt. Wilson. He wanted you to look at the Cat's Eye and really see it. What is its color? Is is blue or do you see green? How big is it? What power are you using to get the best view? Can you see it's central star? Is it 9th or is at 11th magnitude? How about the shell? Scotty never heard from an amateur reporting on seeing it. Back then in the early days the shell wasn't thought of as possible. It wasn't until 2002 that APOD published an "Isaac Newton" image of the shell. What can we see with our modern optics and (hopefully) refined skills.? John Garrett uses a variety of amateur telescopes to record what the Cat's Eye will look like to you. The reverse image below shows what Eric Seavey captured in 2018.
http://www.jgscience.org/astronomy/messiers.html
https://ocastronomers.org/wp-content/uploads/2018/12/Cats-Eye-Nebula.jpg Eric Seavey 2018



The north ecliptic pole lies in Draco, and the south ecliptic pole in Dorado. It is usually explained that the earth wobbles on its axis like a kids top spinning in circles. The wobble the earth makes is a 25,800 year cycle and the cone is about 23½^0 from the vertical. Deneb will be the pole star in about 8,000 years, Vega in about 12,000 years and Thuban will be back to being the north star in 21,500 years. Can't wait.



The funnest story about Thuban is its relationship to the pyramid builders. Thuban was the pole star 4500 years ago and while it is clear that the ancient Egyptians of the 4th dynasty used astronomy to mathematically align the great pyramid, the science dates and the archaeological dates do not coincide to give Thuban any special role.

Draco contains eighty stars, including two of the 2d magnitude, three of the 3d, and sixteen of the 4th--

> " The Dragon next, winds like a mighty stream:
> Within its ample folds are eighty stars,
> Four of the second order.
> Far he waves His ample spires, involving either Bear."

Draco has 14 named stars that go back to very early in its defined life. γ Draconis is Eltanin, the brightest star in Draco at 2nd mag. The name come from the Arabic meaning the great serpent.

β Draconis's name is Rastaban meaning the head of the serpent. δ Draconis is named Altais meaning the goat.
ζ Draconis's name is Aldhibah coming from the Arabic for Hyenas.

Edasich is the name for ι Draconis. Edasich is famous. She is the first giant star found with a planet. Also she has a debris disk. The exoplanet's name is Hypatia. Edasich is derived from the Arabic for male Hyena, Hypatia who was named much later, from the Greek meaning highest or supreme.

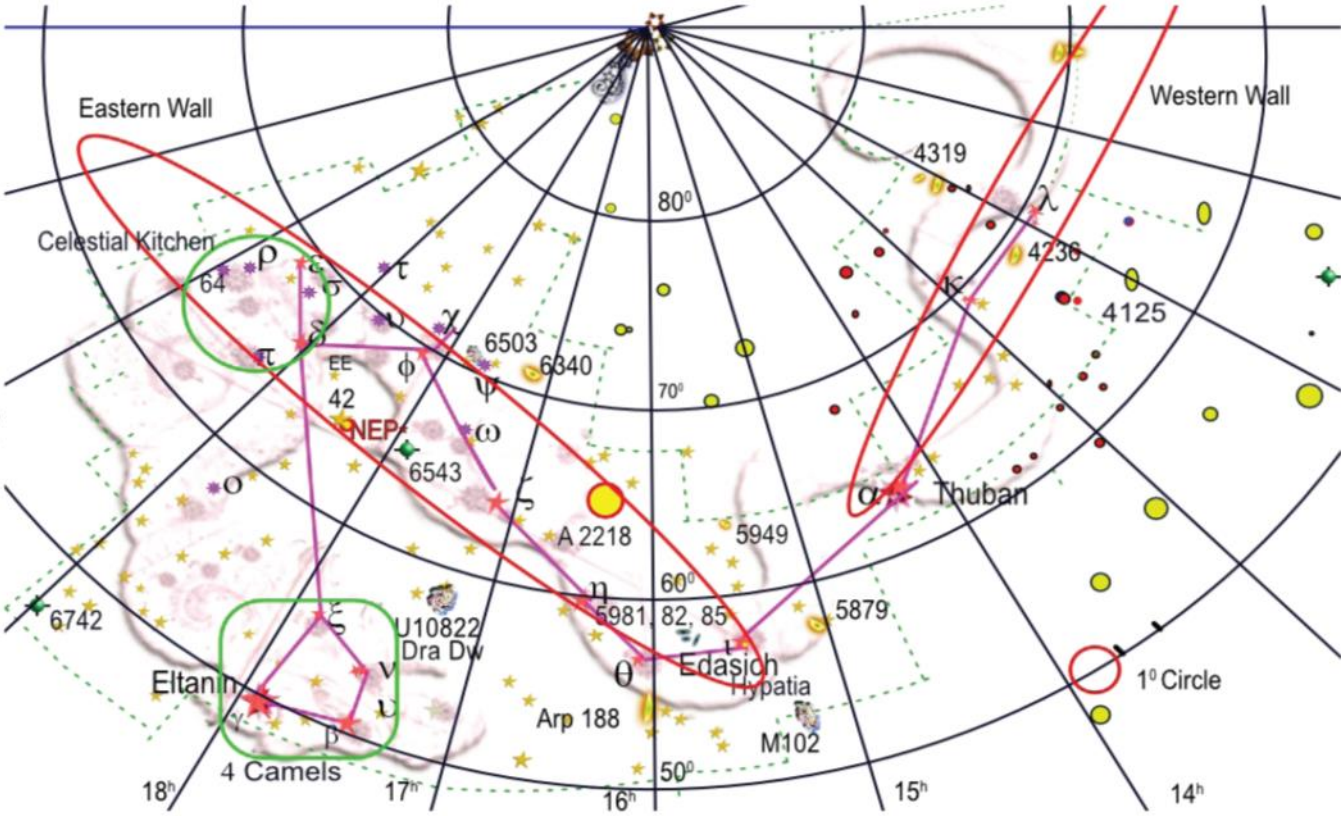
χ Draconis and φ Draconis are named Batentaban Borealis and Batentaban Australis. Being right there at the first loop after the head of Draco, their name means the belly of the serpent.

α Draconis is more famous for its position than for its brightness. Its name is Thuban which means the snake and is between 3rd and 4th magnitude. His claim to fame came 6000 years ago when for 4300 years he was the pole star. There is some question about its variability. Different magnitudes have been given it over the centuries. Admiral Smyth in 1844 measured it at 3.25. Today it is measured half a magnitude fainter at 3.7.
ξ Draconis's name is Grumium, not Greek and not Arabic, but Latin, given its name by Ptolomy. Xi is down by Draco's jaw. Grumium comes from the Latin for snout.

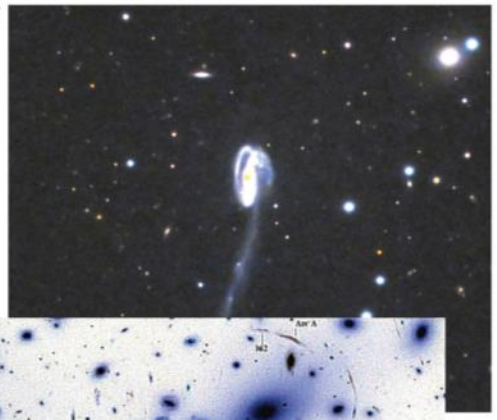
Shǎowèi, κ Draconis, almost 4th magnitude, has an interesting history. On the chart you will see a partial oval from Thuban up past λ and on into Ursa Major and Camelopardolis. This is the "right wall" or historically, "the Second Star of Right Wall of Purple Forbidden Enclosure", representing the "Second Chief Judge". Kappa κ also has an interesting history as an ignored pole star. Kappa was closest to the pole after Thuban vacated the spot for almost 1800 years but was never acknowledged because Kochab, β Ursae Minors, was also nearish and 2nd magnitude.

Alsafi is the name for σ Draconis. It is historically a part of a three star asterism containing sigma, epsilon and tau. Alsafi is the official name of σ sigma. The name comes for the tripod that held the nomad's cook pot. Interestingly, it is also part of a kitchen in Chinese astronomy, marked on the charts and consisting of rho, pi, delta, epsilon and **64** Draconis.

Nu Draconis along with gamma, Mu and Xi make up the head of the dragon and the "Mother Camels" in Arabic. Kuma, the proper name for Nu, seems to have no etymology. If you ask Google, it will tell you it translates to the Japanese for bear.

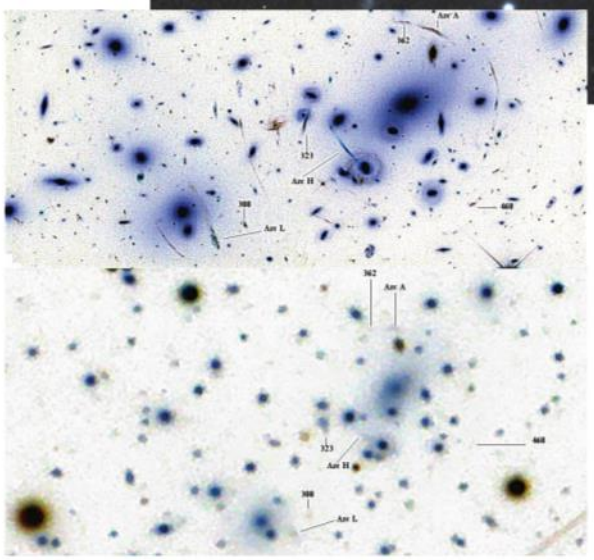


You will find 42 Draconis up by the NEP in the curve of the neck. 42 is named Fafnir and its planet named Orbitar. Orbitar is a made up name referring the NASA space launches. Fafnir is a Norse dwarf that was turned into a dragon. The names were nominated to the exoplanets competition by Brevard County, FL.



I read and reread all of Frank Herbert's Dune books. Admiring the Freman and despising the Harkonnens. μ Draconis is Arrakis, now spelled Alrakis. Mu is a multiple star system. Alrakis B is a double and Alrakis C is at 14th magnitude. In the novels, Arrakis is a planet in the Canopus star system.

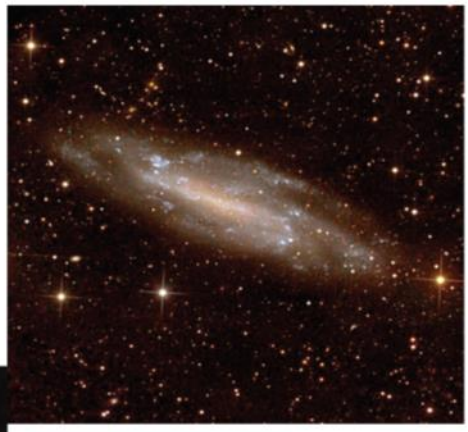
Draco is big, over 1000 square degrees, in the top ten of constellation's size. It has over 300 extrasolar planets, 19 galaxies of 12th magnitude and brighter and the number goes up to 29 when we go into the 13th.
There are two spectacular planetary nebula and two Caldwell objects, C-3, NGC 4236, up by **κ** kappa, is a loosely mottled galaxy that can be seen at 10th magnitude. C6 is NGC 6543,the Cats Eye Nebula.
Burnham lists 116 double and multiple star systems and 49 variables.



There are a number of deep sky objects in Draco that would stretch the imagination and equipment of just about any amateur. Abell 2218 is huge. Nearly 10,000 galaxies and one of the strongest gravitational lenses known. Then there is the Tadpole galaxy, official name Arp 188, or the even more compelling name of UGC 10214.
https://www.astrobin.com/full/288378/B/
At 14th magnitude the Tadpole will not be easy to see. But it is possible to see the tidal tail and maybe even its disrupter galaxy hidden between its spiral arms with enough aperture.

The professional images by Hubble of Abell 2218 are something to marvel at, but visually it will be hard to find. A diligent search found that the brightest galaxy in the frame is UGC413.
14" LX200R @ f/10, L=6x20' RGB=2x20', STL-11000XM, Paramount ME (*Image by Rick Johnson, now deceased*)
https://images.mantrapskies.com/catalog/OTHER/ABELL2218/
I included the specs on this image, finding it hard to believe that an amateur could do such work. If you connect to the link and blow up the image, the arcs show up quite well.

M102, 9th mag, also known as NGC 5866 has been an enigma since added to Messier's list It was discovered in the late 1700's by Messier or maybe Méchain and almost certainly a decade later by Herschel. Since we amateurs today seem to believe the giants on whose shoulders we stand could do no wrong, the controversy over which galaxy they were talking about continued until recently when the IAU decided that M102 and 5866 were the same animal. Photographs tend to blow out the galaxy somewhat. A decent night and some power should resolve the dark lane in the middle of the spindle with even a six inch Newtonian.
https://ocastronomers.org/wp-content/uploads/2018/12/NGC-5866-36m-6F8r1-copy.jpg



N4125 and N4236 are up by the tail of Draco and noticeable because they are both in the 10th magnitude. 4125 is a slightly flattened elliptical that Burham tells us has a bright nucleus that should be easy for you to pick out. 4236 is different. It is a mottled spiral with faint surface brightness but as big as the ¾ moon on its large dimension. Try to find the knots of star formation on the spiral arms.
https://www.coldphotons.com/zen_astro/astro_images/NGC4236_LRGB_web.jpg

https://www.astrobin.com/full/252823/0/

This rather remarkable image, of 4125 taken by Kathy Walter in 2016, also shows the supernova.

https://www.astrobin.com/full/169092/0/
N 5981, 82, 85 Jussi Koponen
https://cosmic-colors.com/galaxies/draco-dwarf/ **Jarrett Trezzo**
You may be able to see 5982 visually. Its 11th magnitude with a somewhat brighter nucleus, but small. 5985 is 12th, the big spiral next to it and 5981 is the other edge-on galaxy, listed at 14> mag. The small group is known as the Draco Triple.

As we continue our discussion on Dwarf galaxies, Draco offers us an object that should be one of our easier. The Draco dwarf is 10th magnitude and, as you can see, has a number of stars usable as finders. The galaxy is listed as a spheroidal dwarf galaxy but is slightly more oval than round. Still, it is slightly larger that the full moon so I expect it to nearly fill the field of view of a 25mm to 32mm eyepiece.

Draco is old. Writers concentrate on the Greek legends, with a few references to Phoenician, Chaldean and Roman authors. But, Draco goes back much further than that. 30,000 years ago Thuban was the pole star. That is near the peak of our last ice age and people were migrating from Africa to the east and to the west and Neanderthals were living in the frozen north. Draco was right there for the cave artists, hunters and spiritual leaders.

The stars of Draco have certainly moved, and our rock art could also be serpents and imaginative steeds.
What we do know is that our ancestors in the last ice age ascribed importance to that sinuous line of stars circling the north. And, as Scotty said; Since Then, Till Now, We are All Poets.
Dark Skys Dave

In addition to using checks and cash, PVAA Members can now pay their dues using Zelle. Send your payment to mathew.wedel@gmail.com using Zelle and it will go into the PVAA bank account.
Please. Include your name and membership type in the Zelle comments.

PVAA Membership Renewal for April 30, 2023

_____ $30 - Individual Membership
_____ $40 – Family Membership
_____ $18 Student Under age 18 Membership

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Thank you for your continued membership!

NASA Night Sky Notes May 2024

This article is distributed by NASA's Night Sky Network (NSN).
The NSN program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit nightsky.jpl.nasa.gov to find local clubs, events, and more!

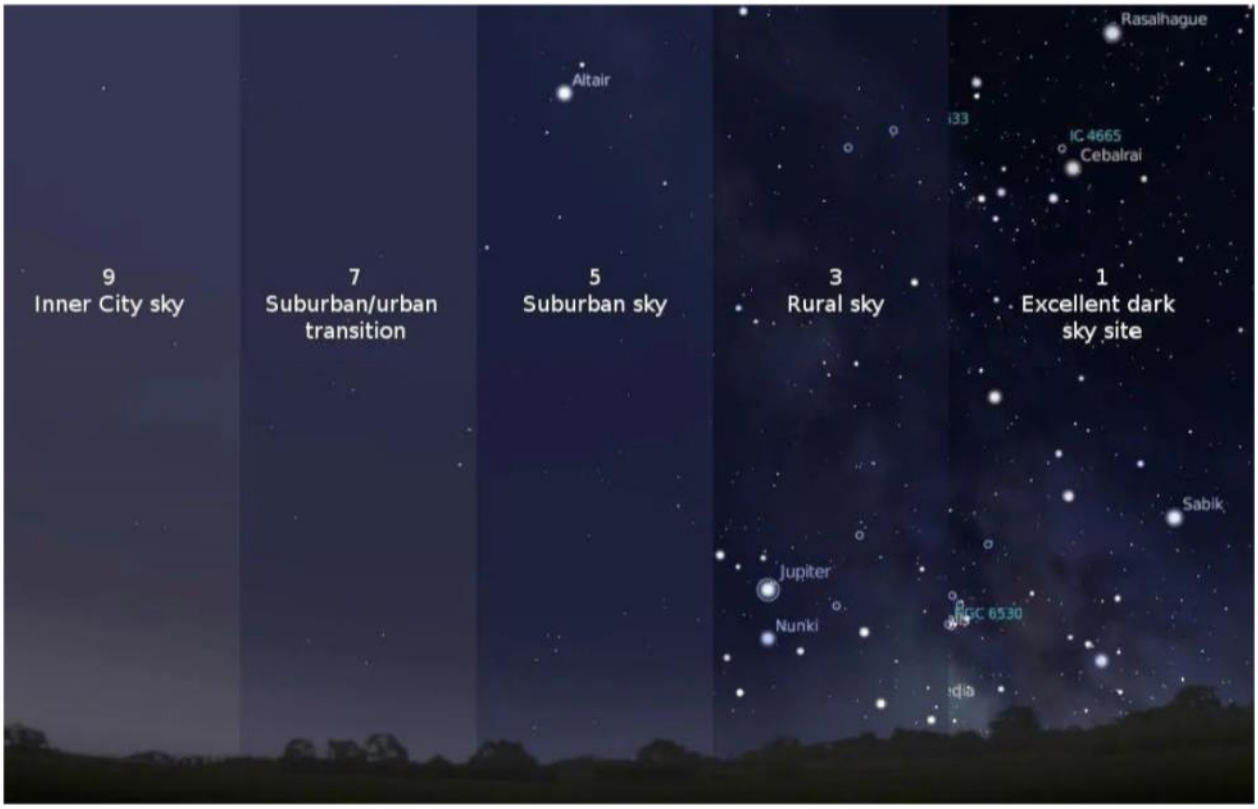
May's Night Sky Notes: Stargazing for Beginners

By Kat Troche

Millions were able to experience the solar eclipse on April 8, 2024, inspiring folks to become amateur astronomers – hooray! Now that you've been 'bitten by the bug', and you've decided to **join your local astronomy club**, here are some stargazing tips!

The Bortle Scale

Before you can stargaze, you'll want to find a site with dark skies. It's helpful learn what your Bortle scale is. But *what is* the Bortle scale? The Bortle scale is a numeric scale from 1-9, with 1 being darkest and 9 being extremely light polluted; that rates your night sky's darkness. For example, New York City would be a Bortle 9, whereas Cherry Springs State Park in Pennsylvania is a Bortle 2.

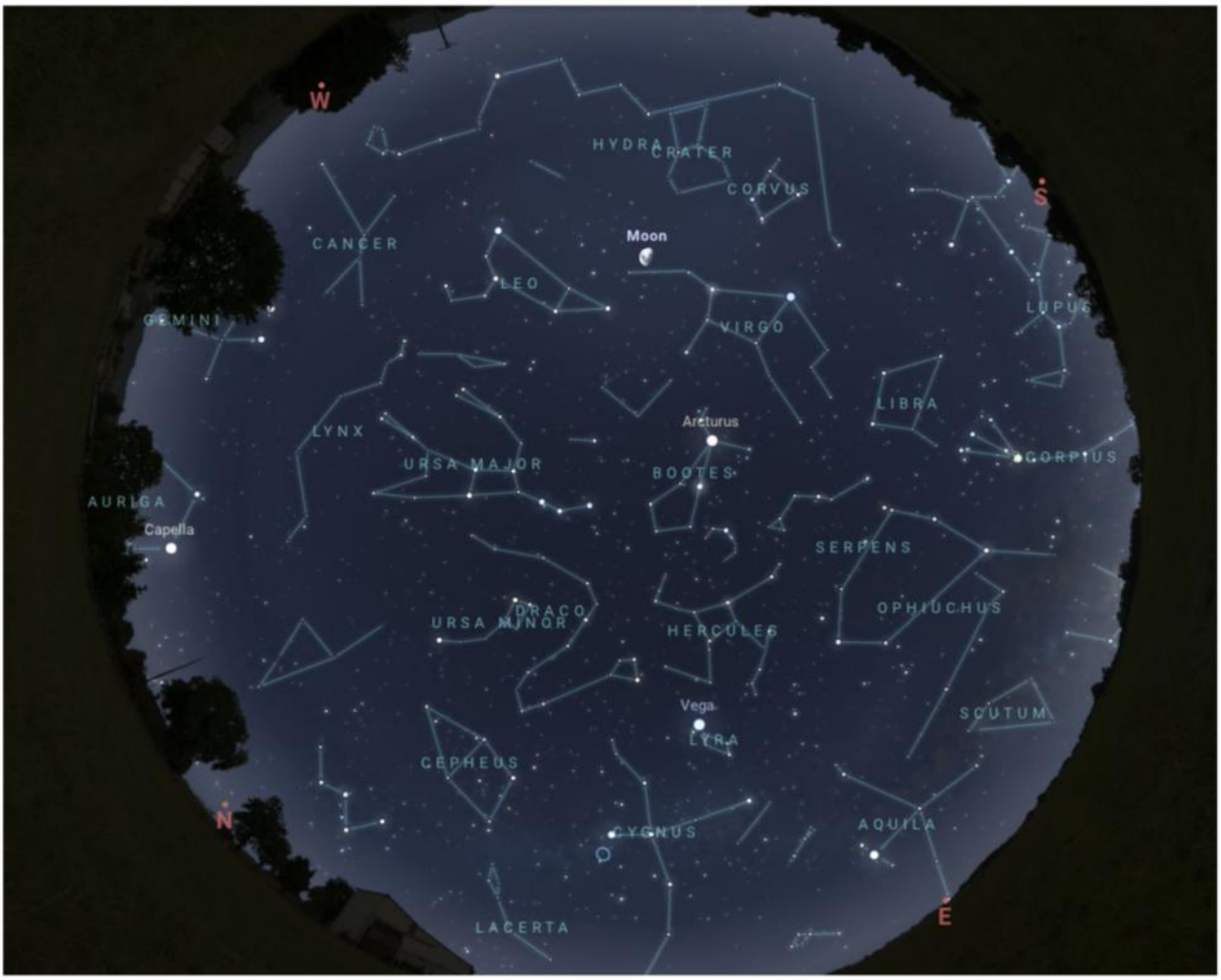


The Bortle scale helps amateur astronomers and stargazers to know how much light pollution is in the sky where they observe. Credit: International Dark Sky Association

Determining the Bortle scale of your night sky will help narrow down what you can expect to see after sunset. Of course, other factors such as weather (clouds namely) will impact seeing conditions, so plan ahead. Find Bortle ratings near you here: www.lightpollutionmap.info

No Equipment? No Problem!

There's plenty to see with your eyes alone. Get familiar with the night sky by studying star maps in books, or with a planisphere. These are great to begin identifying the overall shapes of constellations, and what is visible during various months.



A full view of the northern hemisphere night sky in mid-May. Credit: Stellarium Web.

Interactive sky maps, such as Stellarium Web, work well with mobile and desktop browsers, and are also great for learning the constellations in your hemisphere. There are also several astronomy apps on the market today that work with the GPS of your smartphone to give an accurate map of the night sky.

Keep track of Moon phases. Both the interactive sky maps and apps will also let you know when planets and our Moon are out! This is especially important because if you are trying to look for bright deep sky objects, like the Andromeda Galaxy or the Perseus Double Cluster, you want to *avoid* the Moon as much as possible. Moonlight in a dark sky area will be as bright as a streetlight, so plan accordingly! And if the Moon is out, check out this Skywatcher's Guide to the Moon: bit.ly/MoonHandout

Put On That Red Light

If you're looking at your phone, you won't be able to see as much. Our eyes take approximately 30 minutes to get dark sky adapted, and a bright light can ruin our night vision temporarily. The easiest way to stay dark sky adapted is to avoid any bright lights from car headlights or your smartphone. To avoid this, simply use red lights, such as a red flashlight or headlamp. **The reason:** white light constricts the pupils of your eyes, making it hard to see in the dark, whereas red light allows your pupils to stay dilated for longer. Most smartphones come with adaptability shortcuts that allow you to make your screen red, but if you don't have that feature, use red cellophane on your screen and flashlight.

Up next: why binoculars can sometimes be the best starter telescope, with Night Sky Network's upcoming mid-month article through NASA's website!