NIGHTFALL

A PUBLICATION OF THE HUACHUCA ASTRONOMY CLUB

NOVEMBER 2023

DAVID SAND– SPEAKER AT THE NOVEMBER HAC MEETING

Bio: Dr. David Sand is an observational astronomer with a variety of interests. He spends a lot of his time searching for and understanding the smallest galaxies in the Universe, as they are extremely dark matter dominated and are signposts for structure formation. Dr. Sand is also broadly interested in time domain astronomy, and in particular understanding the progenitors and explosion mechanisms of supernovae. Dr. Sand does some instrument development to further his team's scientific goals. He works as an Associate Professor, Department of Astronomy, & Associate Astronomer, Steward Observatory

2024 HAC DUES

Most HAC memberships expire in December each year. To everyone that has already paid their dues, thank you!

The treasurer will be collecting 2024 dues at the November meeting and the HAC holiday party on Dec 1. Dues are $25 Regular, $35 Family ($20 and $25 active duty military) $10 Student. If you joined HAC in 2023, your dues will be due on the anniversary of your joining and you will be asked to pay a pro-rated amount to adjust your membership to December to coincide with the calendar year.

HAC dues payment options

1. You can pay your dues in person by cash or check made out to Huachuca Astronomy Club. See the treasurer, Ted Forte, at a meeting or event.

2. You can mail your dues check to the Huachuca Astronomy Club PO Box 922, Sierra Vista AZ 85636

3. You can pay online by visiting www.hacastronomy .org and pulling down the membership menu. You'll be directed to Pay Pal where you can use your Pay Pal account OR your credit card.

4. If you have a Pay Pal account, you can use PayPal Direct to send your payment to paypal@hacastronomy.org

5. If you have a Zelle account with your bank, you can make a dues payment by transferring funds to twforte@powerc.net

November Calendar

As of this writing, here is the schedule for November.

- Nov 3: General meeting in room A102, Cochise College Downtown Campus, 2600 E Wilcox Drive at 7 pm
- Nov 7: Artemis Program talk by Ted Forte, Sierra Vista Library, 1pm
- Nov 7: Boys Group at Patterson Observatory 7 pm
- Nov 11: Solar Saturday at Patterson Observatory, 9-11 am
- Nov 14: Church Group at Patterson 6 pm
- Nov 17: Swap meet setup at Patterson
- Nov 18: Telescope Swap Meet at Patterson 9 am
- Nov 30: School field trip 9-11 am
- Dec 1: Holiday party at Thomas and Penny Brondum's home 5:30 pm.

THE PATTERSON OBSERVATORY HOSTS HAC SWAP

November 18th from 9am until 4pm (or until the last person leaves?). The swap meet is THE place to kick some tripods and make some deals. And yes, it is open to the public, so tell a friend (and everyone else!).

This year's selection of donated offerings features telescopes and accessories from basic entry scopes to nearly turnkey observatories. Everything to advance your enjoyment of our wonderful hobby (read: "obsession"). Item prices range from $1.00 to over $10,000, with items ranging from stocking stuffers to full observatory ensembles. So,

bring cash and checks (with proper ID). All proceeds from donated items benefit HAC.

Do bring your own scopes and astro stuff to sell and or trade. For those of us who have indulged in this hobby for some time it is also be a great time to clear out underused scopes and observing niceties and get them to others that can use and cherish them.

Tables will be available on a first come basis the morning of the sale. Some of us will be there early so you can set up before the 9am opening.

HAC does not charge for selling space but does appreciate cash donations from participants' sales.

HAC Holiday Party

This year's holiday party will be on Friday December 1 at the home of Penny and Thomas Brondum, 4071 S. Huron Pl. in Sierra Vista from 5:30 to 9 pm. The party is in lieu of the regular meeting scheduled for that date. The party will be catered by Pizzeria Mimosa: $18 per person ($9 for children under 12). Those wishing to attend are asked to pay in advance and RSVP to the treasurer, Ted Forte (tedforte511 at gmail dot com), by November 24. See the flyer attached to the newsletter.

Give Your Input to the City Planners

It is very important to assist the Sierra Vista city planners with our perspectives as astronomers. Accounting for astronomical needs is not their strong suit. It's important that we give them valuable information regarding desirable plans for future projects and that the council realizes there are a number of astronomy enthusiasts in the Sierra Vista area

Bright light in Benson – Public Hearing

The Benson planning and zoning commission will hold a public hearing to review an application for a conditional use permit for the Maverik gas station's sign height of 100 feet tall parcel 123-47-203f On November 9, 2023 at 5:30pm at the Benson city council chambers 599 South Ragoon Street, Benson, Arizona

Public Hearing on November 9, 2023, at 5:30 PM.

The purpose of this Public Hearing will be to receive comments on a proposed conditional use permit for a sign height of 100 feet high for the upcoming Maverik gas station. Maverik has had a previous conditional use permit approved for an 86-foot-high sign, but they would like to revise the height to 100 feet in height.

Please call Christine McLachlan at (520) 432-9266 or Abbie King at (520) 720-6328 for questions.

All facilities are handicapped accessible. If you have a special accessibility need, please contact Vicki L. Vivian, City Clerk at (520) 586-2245 or TDD: (520) 586-3624, no later than eight [8] hours before the scheduled meeting time.

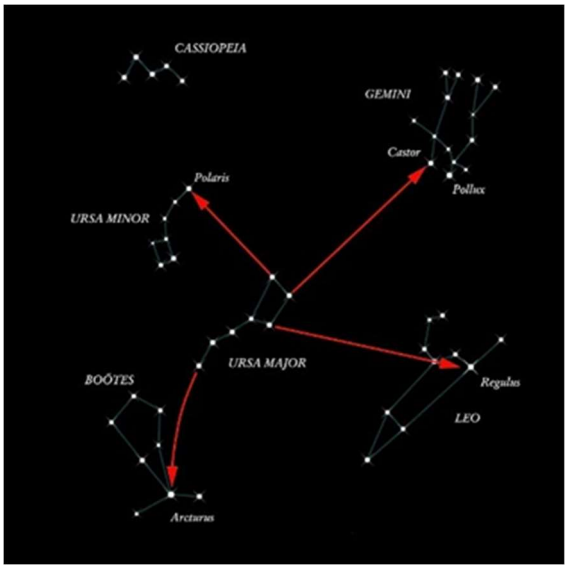
POSTED this 24th day of October 2023

PUBLISHED this 25th day of October 2023

PUBLISHED this 1st day of November 2023

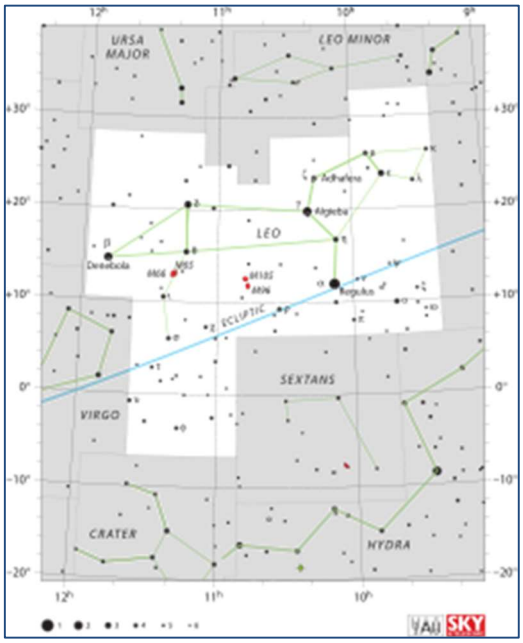
President's Constellation Exploration (Nov 2023)

Last month I continued an exploration of constellations based on this graphic which shows how to use stars in the big dipper to find four major constellations in the night sky. The intent is to explore one constellation a month. Last month was Gemini (the Twins) so going clockwise this month is Leo (and just for fun, Leo Minor).



Leo is one of the constellations of the zodiac, between Cancer the crab to the west and Virgo the maiden to the east.

It is located in the Northern celestial hemisphere. Its name is Latin for lion, and to the ancient Greeks represented the Nemean Lion killed by the mythical Greek hero Heracles as one of his twelve labors. It's one of the 48 constellations described by the 2nd-century astronomer Ptolemy, Leo remains one of the 88 modern constellations today, and one of the most easily recognizable due to its many bright stars and a distinctive shape that is reminiscent of the crouching lion it depicts. The lion's mane and shoulders also form an asterism known as "The Sickle," which to modern observers may resemble a backwards "question mark."



Leo was one of the earliest recognized constellations, with archaeological evidence that the Mesopotamians had a similar constellation as early as 4000 BCE. The Persians called Leo Ser or Shir; the Turks, Artan; the Syrians, Aryo; the Jews, Arye; the Indians, Simha, all meaning "lion".

Some mythologists believe that in Sumeria, Leo represented the monster Humbaba, who was killed by Gilgamesh. In Babylonian astronomy, the constellation was called UR.GU.LA, the "Great Lion"; the bright star Regulus was known as "the star that stands at the Lion's breast." Regulus also had distinctly regal associations, as it was known as the King Star.

In Greek mythology, Leo was identified as the Nemean Lion which was killed by Heracles during the first of his twelve labours. Zeus was said to commemorate this labor by placing the Lion in the sky. The Roman poet Ovid called it Herculeus Leo and Violentus Leo. Bacchi Sidus (star of Bacchus) was another of its titles, the god Bacchus always being identified with this animal. However, Manilius called it Jovis et Junonis Sidus (Star of Jupiter and Juno).

The constellation Leo can be seen by the naked eye. Leo contains many bright stars, many of which were individually identified by the ancients. There are four stars of the first or second magnitude, which render this constellation especially prominent: Regulus, designated Alpha Leonis, is a blue-white main-sequence star of magnitude +1.34, 77.5 light-years from Earth. It is a double star divisible in binoculars, with a secondary of magnitude 7.7. Its traditional name (Regulus) means "the little king". Denebola (Beta Leonis) at the opposite end of the constellation to Regulus. It is a blue-white star of magnitude +2.23, 36 light-years from Earth. The name Denebola means "the lion's tail". Algieba, (Gamma Leonis) which means "the forehead" is a binary star. The primary is a gold-yellow giant star of magnitude 2.61 and the secondary is similar but at magnitude +3.6; they have a period of 600 years and are 126 light-years from Earth. And Zosma (Delta Leonis) a blue-white star of magnitude +2.58, 58 light-years from Earth. There are other stars with meaningful names as well. Modern astronomers, including Tycho Brahe in 1602, excised a group of stars that once made up the "tuft" of the lion's tail and used them to form the new constellation Coma Berenices (Berenice's hair), although there was precedent for that designation among the ancient Greeks and Romans.

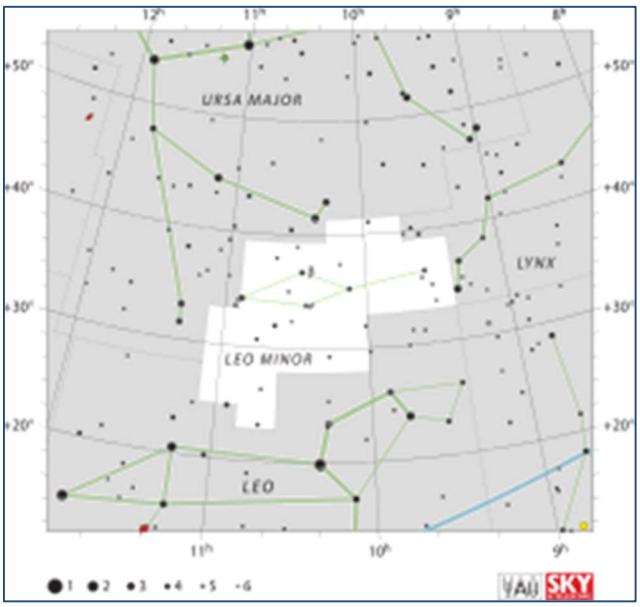
Leo contains many bright galaxies; Messier 65, Messier 66, Messier 95, Messier 96, Messier 105, and NGC 3628 . The first two and NGC 3628 are known as the Leo Triplet.

The Leo Ring, a cloud of hydrogen and helium gas, is found in the orbit of two galaxies found within this constellation. M66 is a spiral galaxy is at a distance of 37 million light-years and has a somewhat distorted shape due to gravitational interactions with the other members of the Triplet, which are pulling stars away from M66. Eventually, the outermost stars may form a dwarf galaxy orbiting M66. Both M65 and M66 are visible in large binoculars or small telescopes, but their concentrated nuclei and elongation are only visible in large amateur instruments.

M95 and M96 are both spiral galaxies 20 million light-years from Earth. Though they are visible as fuzzy objects in small telescopes, their structure is only visible in larger instruments. M95 is a barred spiral galaxy. M105 is about a degree away from the M95/M96 pair; it is an elliptical galaxy of the 9th magnitude, also about 20 million light-years from Earth.

The Leonids Meteor shower occurs in November, peaking on November 14–15, and have a radiant close to Gamma Leonis. Its parent body is Comet Tempel-Tuttle, which causes significant outbursts every 35 years. The normal peak rate is approximately 10 meteors per hour. The January Leonids are a minor shower that peaks between January 1 and 7.

Leo Minor is a small and faint constellation. Its name is Latin for "the smaller lion", in contrast to Leo, the larger lion. It lies between the larger and more recognizable Ursa Major to the north and Leo to the south. Leo Minor was not regarded as a separate constellation by classical astronomers; it was designated by Johannes Hevelius in 1687.



The classical astronomers Aratus and Ptolemy had noted the region of what is now Leo Minor to be undefined and not containing any distinctive patterns; Ptolemy classified the stars in this area as amorphōtoi (not belonging to a constellation outline) within the constellation Leo.

Johannes Hevelius first depicted Leo Minor in 1687 when he outlined ten new constellations in his star atlas Firmamentum Sobiescianum. Hevelius decided upon Leo Minor or Leo Junior as a depiction that would align with its beastly neighbors the Lion and the Great Bear. Richard A. Proctor gave the constellation the name Leaena "the Lioness" in 1870, explaining that he sought to shorten the constellation names to make them more manageable on celestial charts.

In Chinese astronomy, the stars Beta, 30, 37 and 46 Leonis Minoris made up Neiping, a "Court of Judge or Mediator", or Shi "Court Eunuch" or were combined with stars of the neighboring Leo to make up a large celestial dragon or State Chariot. A line of four stars was known as Shaowei; it represented four Imperial advisors and may have been located in Leo Minor, Leo or adjacent regions.

Leo Minor has been described as having "dubious claims to a separate identity". It is a small constellation bordered by Ursa Major to the north, Lynx to the west, Leo to the south, and touching the corner of Cancer to the southwest. Leo Minor is ranked 64th out of 88 constellations in size. Leo Minor covers an area of 232.0 square degrees, or 0.562 per cent of the sky.

There are only three stars in the constellation brighter than magnitude 4.5, and 37 stars with a magnitude brighter than 6.5 including two stars with planetary systems. Of note, Leo Minor does not have a star designated Alpha because Baily erred and allocated a Greek letter to only one star, Beta. It is unclear whether he intended to give 46 Leonis Minoris a Bayer designation, as he recognized Beta and 46 Leonis Minoris as of the appropriate brightness in his catalogue.

In terms of deep-sky objects, Leo Minor contains many galaxies viewable in amateur telescopes. NGC 3432 is seen nearly edge on. It is located 42 million light-years away, and is moving away from the Solar System at a rate of 616 km per second. In 2000, a star within NGC 3432 galaxy brightened to magnitude 17.4. It has tidal filaments and intense star formation, so it was listed in Halton Arp's Atlas of Peculiar Galaxies. NGC 3003, a SBbc barred spiral galaxy and is seen almost edge-on. NGC 3344, 25 million light-years distant, is face-on towards Earth. NGC 3504 is a starburst barred spiral galaxy. It has hosted supernovae in 1998 and 2001. It and the spiral galaxy NGC 3486 are also almost face-on towards Earth and NGC 2859 is an SB0-type lenticular galaxy.

The unique deep-sky object known as Hanny's Voorwerp was discovered in Leo Minor in 2007 by Dutch school teacher Hanny van Arkel while participating as a volunteer in the Galaxy Zoo project. Lying near the 650-million-light-year-distant spiral galaxy IC 2497, it is around the same size as the Milky Way. It contains a 16,000-light-year-wide hole. The Voorwerp is thought to be the visual light echo of a quasar now gone inactive, possibly as recently as 200,000 years ago.

The Leonis Minorid meteor shower peaks between 18 and 29 October. The shower's parent body is the long period comet C/1739 K1 (Zanotti). It is a minor shower, and can only be seen from the Northern Hemisphere.

I hope you caught the Leonis Minorid event in October and will enjoy the Leoids in mid-November. Almost a 2 for 1 like this note. Good viewing and a Happy Thanksgiving to all.

The Bucket List – November 2023

by Vince Sempronio

This column highlights interesting non-seasonal nighttime, and sometimes daytime sky events that the reader may not be aware of and may wish to observe. I'll cover one-off events that are special, rare, or uncommon.

TERM OF THE MONTH

This month's terms (yes, a bonus term) are ***ingress*** and ***egress***. These terms are used often in NASA-speak when referring to the motion of astronauts interacting with spacecraft, but they also have context as astronomical terms. They, as they sound, are opposites of each other. Simply speaking, ingress refers to entering and egress refers to exiting. An example is when one of moons of Jupiter starts to transit Jupiter's face. This is the ***ingress***. When the moon exits the face of Jupiter, it is the ***egress***. The easiest way to remember the difference between the terms is to remember that ***ingress*** starts with "in". Going in or beginning. ***Egress*** starts with "e", for exit, or ending.

IN THE SKY

Opposition of Jupiter – Jupiter will be at its peak early in November, but is there ever a bad time to observe Jupiter? At opposition, Jupiter will be 595 million miles from earth and shines at magnitude -2.9. At the time of this writing, Jupiter has 95 satellites. Remember that for the next public night! Recalling the mnemonic for identifying the order of the Galilean Moons' orbits from closest to furthest. "I Eat Grandma's Cookies" (IEGC). Early (3:30am) on the morning of November 19th in the western sky, the four moons will be aligned on the west side of Jupiter in IEGC order. On the evening of November 23rd around 8:30pm, the four moons will again be aligned in IEGC order, this time, on the east side of Jupiter. The order is from closest to Jupiter to furthest. The moons are also clustered relatively close together.

On the morning of November 9th, around 5 am, towards the east, before sunrise, Venus and the Moon will make a striking pair. Venus, at magnitude -4.3 is < 2° above the thin crescent moon.

This year's Leonid meteor shower won't have any interference from the Moon, so it should be a good opportunity for the peak on the night of the 17th. The radiant is high in the western sky early in the morning.

The monthly HAC public night is on the evening of the 16th. The moon that night is a thin crescent, so get to the Patterson early as the Moon will be lost around 7:30pm.

Mars finally reaches opposition on the far side of the Sun on the 18th. Mars and the Earth race around the Sun with Mars trying its hardest to keep up. Mars has been in the night sky since its opposition back in early December of 2022.

The bright gibbous Moon will be about 2.5° from Jupiter in the morning hours of the 25th. They set together in the west.

On the night of the 26th, around 7 pm, The almost full moon will be just below the Pleiades. I mention this because later in 2024, the Moon begins a series of occultations of the Pleiades over a couple of years. More on this as the events draw closer.

TRIVIA OF THE MONTH

On May 8th, 1981, asteroid 9000 was discovered, then given the provisional designation of 1981 JO. It was found to be a slow rotator with a period of 908 hours. The asteroid resides in the inner main belt and is about 4km (2.5m) in diameter. 1981 JO was discovered by American astronomer Edward Bowell at a Lowell Observatory facility near Flagstaff, AZ. He has discovered nearly 600 minor planets over his career. The asteroid orbits the Sun between 1.8-2.7 AU once every 3.3 years and poses no threat to Earth. It is a stony S-type asteroid based on spectral analysis. The asteroid was officially named by the Minor Planet Center on May 4th, 1999. Even astronomers have a since of humor, since there is only one name that is appropriate for an asteroid with the number 9000. You probably guessed it, asteroid 1981 JO was officially given the fitting name of Hal, after the antagonist supercomputer from the movie *2001: A Space Odyssey*.

As a side note, asteroid 4923 (Clarke) is named after Authur C. Clarke who was the writer of the story the movie is based on, and asteroid 10221 is named for Stanley Kubrick, the director of the movie.

I'm sure Paul Harvey would have said, "And now you know, the rest of the story".

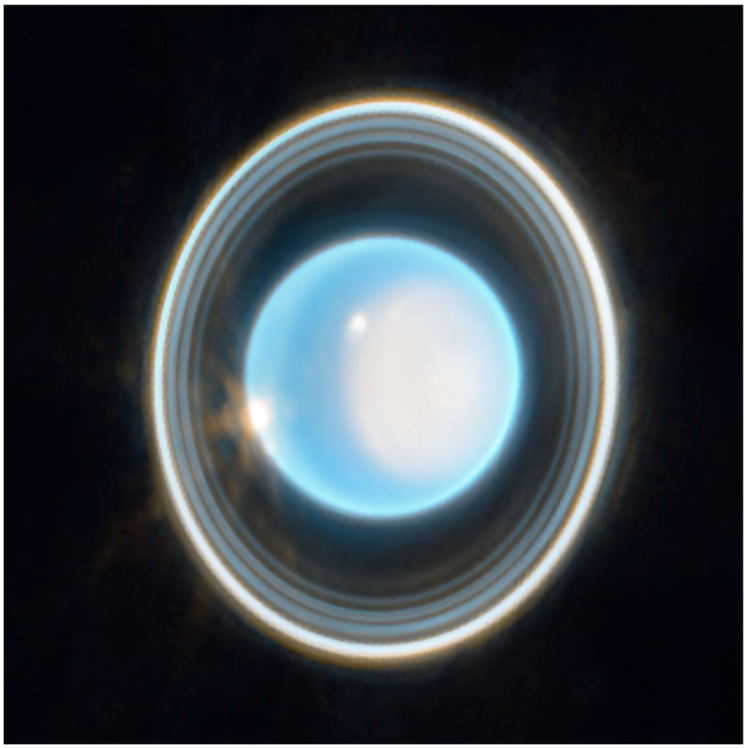
NASA Night Sky Notes November 2023

This article is distributed by NASA Night Sky Network

The Night Sky Network program supports astronomy clubs across the USA dedicated to astronomy outreach. Visit nightsky.jpl.nasa.org to find local clubs, events, and more!

Spy the Seventh Planet, Uranus

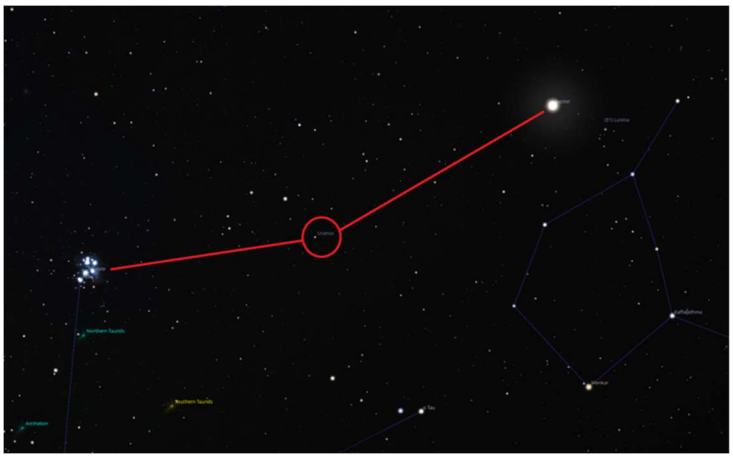
By Liz Kruesi



You might be familiar with Saturn as the solar system's ringed planet, with its enormous amount of dust and ice bits circling the giant planet. But Uranus, the next planet out from the Sun, hosts an impressive ring system as well. The seventh planet was the first discovered telescopically instead of with unaided eyes, and it was astronomer extraordinaire William Herschel who discovered Uranus March 13, 1781. Nearly two centuries passed before an infrared telescope aboard a military cargo aircraft revealed the planet had rings in 1977.

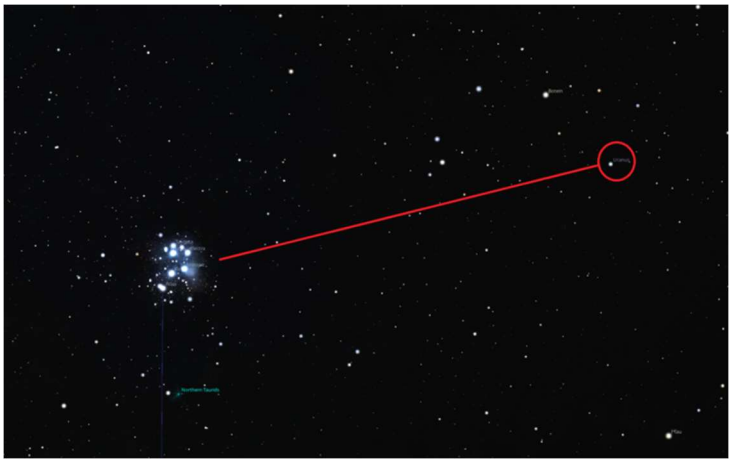
Since that discovery, multiple observatories have revealed more details of Uranus and its ring system. Most recently, the NASA-led JWST space observatory captured the planet and its rings in detail. This recent image combines just 12 minutes of exposure in two filters to reveal 11 of the planet's 13 rings. Even some of the planet's atmospheric features are visible in this image. Even with advanced imaging like that from JWST, much of Uranus remains a mystery, including why it orbits the Sun on its side. This is because only one spacecraft has ever visited this planet: NASA's Voyager 2, which flew by the distant planet in the mid-1980s.

Planetary scientists are hoping to change that soon, though. Scientists recommended in a report released last year from the National Academies of Sciences, Engineering, and Medicine that Uranus be the focus on the next big planetary science spacecraft mission. Such a large-scale mission would gain insight into this icy giant planet and the similar solar system planet, Neptune.



Sky map picturing M45, Uranus and Jupiter, Stellarium

If you want to catch a view of Uranus with your own eyes, now is prime time to view it. This ice giant planet lies perfectly positioned in mid-November, at so-called "opposition," when its position in its orbit places it on the other side of the Sun from Earth. That location means our star's light reflects off Uranus' icy atmosphere, and the planet appears as its brightest.



Sky map picturing M45 and Uranus, Stellarium

To find it, look overhead just after midnight on November 13. Uranus will lie about halfway between the brilliant planet Jupiter and the diffuse glow of the Pleiades star cluster (M45). While Uranus may look like a bright blinking star in the

night sky, its blue-green hue gives aways its identity. Binoculars or a telescope will improve the view.

For more about this oddball planet, visit NASA's Uranus page.

Image 1:

Uranus hosts 13 faint rings, 11 of which are visible in this JWST image. The planet was 19.67 times the Earth-Sun distance from our planet (1.83 billion miles) when JWST captured exposures through two near-Infrared filters on February 6, 2023. The white region in the right side of Uranus is one of the planet's polar caps. This icy world orbits the Sun differently from the rest of the solar system's planets – Uranus rolls along on its side.

[NASA, ESA, CSA, STScI; Image Processing: Joseph DePasquale (STScI)]

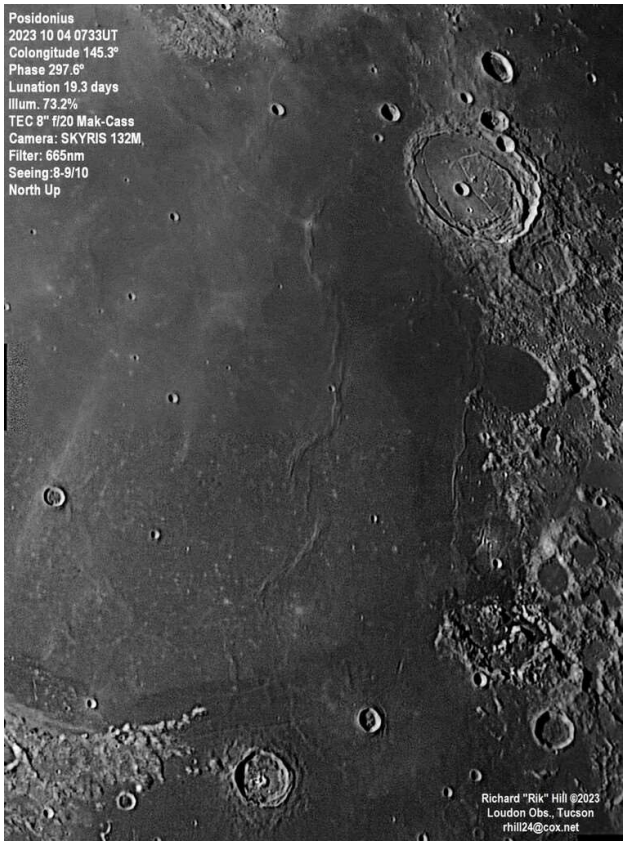
Moon Wrinkles

By Rik Hill

At my age one usually does not invite conversation about wrinkles. But, no matter, I will plunge into the topic! Here we see sunset on the great crater Posidonius (99km dia.) in the upper right of this image with the wonderfully fractured floor. Below this crater is another much older crater, Charcornac (53km). You can guess at its relative age just by the ruin of its walls and the many rimae that cross its floor. Moving further south we come to the fascinating embayment opening on Mare Serenitatis, Le Monnier (63km) also very old, possibly going back to just after the formation of the Moon itself. Then at the bottom of this right edge is another embayment with a crater above and below filled with rough peaks. The crater below is Vitruvius (31km) and above is none other than Littrow (32km) with the rough peaks being near the Taurus-Littrow landing site of Apollo 17.

Between Littrow and Le Monnier is what we used to call "wrinkle ridges". The two here form a fairly straight line named Dorsa Aldovandri. Then further out in the mare and parallel to this coastline is another larger wrinkle ridge Dorsa Smirnov, not having anything to do with a beverage but named for 20th century Soviet naturalist. In my early days of lunar observing, early 1960s, this was called the "Serpentine Ridge" and it took a little work before I clearly saw it in my little 2.4" refractor. In a larger telescope it can be quite impressive. The uppermost end of the main dorsum is split into a "Y" and the bottom end terminates just north of the crater Plinius (44km) seen at the bottom edge of this image where Smirnov splits off into Dorsa Lister and farther on, Dorsum Nicol. Where the dorsum splits on the north end you will see a white spot at that point. You can see a tiny 2km crater in the middle of that white spot. This is Posidonius Y. The crater and it's white ejecta has nothing to do with the dorsum, just a coincidental juxtaposition and is actually just a couple kilometers south of the split.

Before leaving, notice the large 50km ghost crater to the upper left of Plinius in Serenitatis. It even has a ghost central peak!



This was made from portions of 3, 1800 frame AVIs stacked with AVIStack2 (IDL) and put together with MS ICE software then finished off with GIMP and IrfanView.

Photos from Solar Eclipse at Kartchner and S.V. Library

Items For Sale

William Optics refractor

David Lobb is selling a "like new" William Optics refractor. He never mentioned the aperture (I think it's 92mm ?). The photos he sent show that it has a UniGuide Scope M-G32PB-RD with a ZWO ASI 120MC-S camera. It's on a SkyWatcher Pro Gem mount.

He says:

"*It is in like new condition and has been stored inside my office. I have all the boxes except for the stand. I will sell it all for 2k. No less.*

Interested folks can call me at 253 632 2888. I live in Sierra Vista in the Winterhaven complex

Davis Lobb 253 632 2888 "

Coronado Solar Max II

Gino Garcia is selling a Coronado Solar Max II 60 Double Stack telescope. He is Asking $3,000 for everything but open to reasonable offers.

The telescope comes with the following:

- Coronado Solar Max II 60 Double Stack Telescope
- 1 x Coronado CEMAX Barlow
- 2 x Coronado CEMAX 25mm Eyepiece
- 2 x Coronado CEMAX 18mm Eyepiece
- 2 x Coronado CEMAX 12MM Eyepiece

Excellent like new condition. Free Shipping with insurance

Contact Gino Garcia

gino.garcia3116@gmail.com 210-365-6248

10-inch f/10 LX200 Meade 'Classic'

Jay LeBlanc is selling a fork mounted SCT with good optics that can be used as an alt/az or equatorial.

1 - 1/4" and 2-in visual back.

He has cleaned the scope, calibrated the servo drives and replaced the tantalum capacitors (a weak spot of the design) with new high voltage units.

The GOTO mount works very nicely and has a touring mode where you can move the scope to the next nearby object.

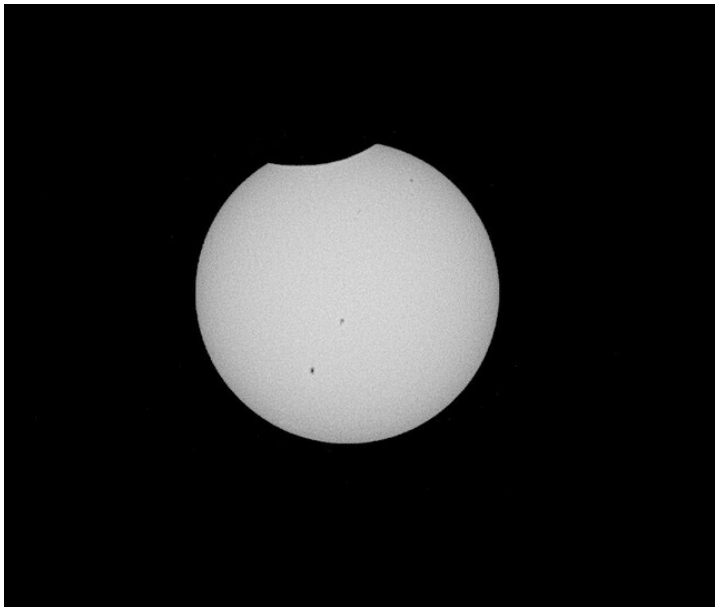
Includes field tripod, equatorial wedge, power supply, factory DEC cable and new hand control.

Have optional Losmondy D style rail and counterweight attachment.

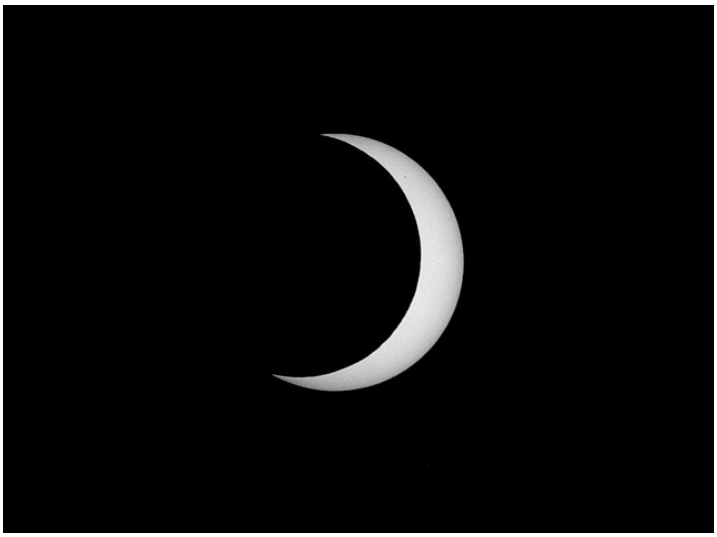
No eyepieces or finder scope.

$1200 PM Jay LeBlanc if interested.

Pictures from HAC Astro

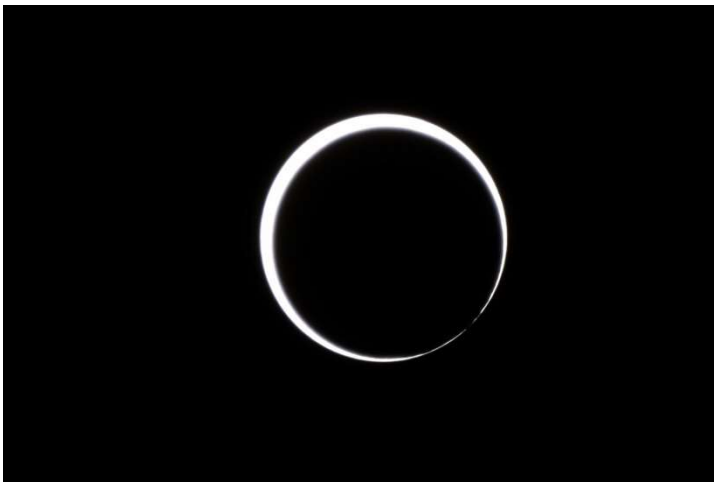


Annular Solar Eclipse Minimum by Richard Lighthill



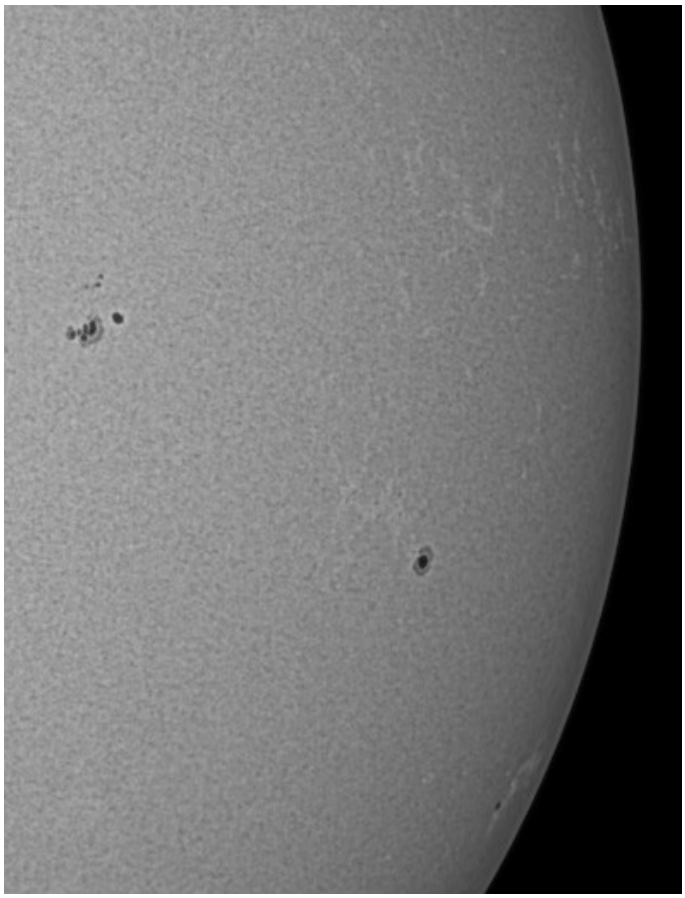
Annular Solar Eclipse Minimum by Richard Lighthill

Solar Eclispse by Vince Sempronio



Solar Eclipse with Bailey Beads by David Tannenbaum

M27 by Leonard Amburgey



Sunspots by Richard Lighthill

Lynds' Bright Nebula 418 by Glen Sanner

Website:	*http://www.hacastronomy.org*
Facebook:	*http://www.facebook.com/HuachucaAstronomyClub*
Email:	*info@hacastronomy.org*

Club Officers and Contacts

President: *Penny Brondum* ***Vice President:*** *Karen Madtes*

Secretary: *Katherine Zellerbach* ***Treasurer:*** *Ted Forte*

Past President: *David Roemer*

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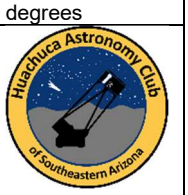
HAC Nov Dec 2023 Calendar of Events

SU	MO	TU	WE	TH	FR	SA
29 Jupiter 3° from moon	**30**	**31** 	**Nov 1**	**2**	**3** **HAC Meeting Room A102 7PM** Jupiter opposition	**4**
5 **1:37 AM** Daylight Savings Time Ends	**6**	**7** Boy's Group at Patterson 7PM	**8**	**9** Venus 1° from moon	**10**	**11**  Solar Saturday 9AM
12	**13** **2:27 AM** Uranus Opposition	**14** Church Group at Patterson 6-8 PM	**15**	**16** Public Night at Patterson 6 PM	**17** Set up Swap Meet. 9AM Leonid Meteors	**18** TELESCOPE SWAP MEET PATTERSON 9AM Leonid Meteors
19 Swap meet wrap up and clean up 9 AM Leonid Meteors	**20** **3:50 AM** Saturn 3° from moon	**21**	**22** Senior Group at Patterson 6PM	**23** 	**24**	**25** Jupiter/Moon 3 degrees
26 Uranus/Moon 3 degrees	**27** **2:16 AM**	**28** Venus/Spica 4 degreees	**29**	**30** Carmichael School Field Trip 9-11 AM	**1 Dec** **Holiday party at the Brondums**	**2**
3	**4** **10:49PM** Mercury eastern elongation	**5**	**6**	**7** 	**8**	**9**
10	**11**	**12** **4:32 PM**	**13** Geminid Meteors	**14** Public Night at Patterson 6 PM Geminid Meteors	**15** Geminid Meteors	**16**
17 Saturn/Moon 2 degrees	**18**	**19** **11:39 AM** Neptune/Moon 1.3 degrees	**20**	**21** Winter Solstice 8:27 PM Vesta Opposition	**22** Jupiter /Moon 3 degrees	**23** Uanus/Moon 3 degrees
24	**25** 	**26** **5:33 PM**	**27**	**28**	**29**	

All times local MST
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