SIRIUS ASTRONOMER

www.ocastronomers.org

The Newsletter of the Orange County Astronomers

March 2024 Free to members, subscriptions $12 for 12 issues **Volume 51, Number 3**

This is a portion of the Taurus Molecutlar Cloud featuring LBN777 (the Little Eagle) nebula in upper left and B10 dark nebula near middle bottom. It was captured by David Fischer at the OCA site using a 50mm refractor and ASI2600MC camera in December 2021.

Upcoming Events - free and open to the public

Beginner's class	Friday, 5 April at 7:30 to 9:30 PM **ONLINE** This is session 2 of the class: Covers equipment used to observe the night sky: telescopes, mounts, eyepieces, filters, with advantages and disadvantages.
Club Meeting	Friday, 8 March at 7:30 to 9:30 PM **IN PERSON** at Chapman University and **ONLINE** "What's Up?": Chris Butler from OCA Main speaker: Mike Hudson from Waterloo University speaking on "Cosmic Mirages: Seeing Dark Matter with Gravitational Lenses"
Open Spiral Bar	Saturday, 9 March at 10:00 to 11:30 PM **ONLINE** Want to socialize? Grab your images, experiences, questions, or none and see your fellow Orange County Astronomers face-to-face.
Star Parties	Saturday, 9 March at the OCA Anza site. ??? Irvine site dates are yet to be determined

The monthly club meeting is viewable in progress on Zoom and our social media platforms. The recording is available on these platforms after the meeting is over.

https://twitter.com/OCAstronomers
https://www.facebook.com/OrangeCountyAstronomers
https://www.youtube.com/@ocastronomers

Please consult the calendar on the OCA website to RSVP online meetings (required)

President's Message

By Barbara Toy

Those of you who missed the February General Meeting missed an excellent talk – Dr. Cara Battersby, who developed and leads the Milky Way Laboratory at the University of Connecticut and who has an avid interest in star formation, talking not just about star formation out in the body of galaxies, where we're more familiar with it, but star formation under the very different conditions at the center of our galaxy and the implications for star formation under different conditions in other galaxies. She kindly stayed around quite a while afterward to answer questions even though it was after midnight in Connecticut by then. The program led off with what turned out to be an excellent introduction to the main talk (and excellent on its own terms) – a "What's Up" by Alex McConahay from the Riverside Astronomical Society focusing on famous and less-visited objects and areas in Orion, which contains one of the closest star-forming areas to us. It was a truly excellent evening.

February was one of those fairly rare months when Chapman University needed to use the Irvine Auditorium for its own event on our usual meeting night, so our meeting was moved to the third Friday of the month. I know some people forgot or didn't get the word on the change, and I'm sorry that was the case. I believe the video from the meeting will be posted on our YouTube Channel, and recommend you check that out. If you're not familiar with our YouTube Channel, you can get to it from the link at the bottom of the homepage (and other pages on our website); it's the second link in the list under "Social Media."

It's a good idea to check our website (homepage or calendar) or the meeting information on the first page of the Sirius Astronomer near the beginning of each month to make sure of the date for the meeting and whether there are any unusual plans for the meeting. That can also whet your appetite for the main talk – Reza, our esteemed Vice President (and Webmaster) continues to find us top-notch speakers on an array of interesting topics who you don't want to miss!

Anza

While our Anza site hasn't had as much rain as most areas in Orange and Los Angeles Counties, it has had a lot of rain for the area. That generally translates to a lot of mud and damage to the dirt roads going to our site. If you're planning to go out there, please check on our email groups, particularly the AstroImagers group, for any updates on conditions out there, and make sure your vehicle can handle the conditions before making the drive. It's really frustrating to spend a couple hours on the road to get out there only to realize, looking at an expanse of deep mud or a wash-out on the road ahead of you, that it would be too dangerous to attempt to drive that stretch. Of course, what would be worse would be to attempt it and then get stuck…

Fortunately, our neighbors along the route have been good about repairing the roads, so access will be reestablished, but they can't be expected to do it instantly. If you see anyone out repairing the road and can thank them, please do. And despite the rains, I hope you've been able to get in some viewing of the winter sky!

From the Editor

Due dates for submission of articles, pictures and advertisements

Issue	**Due date**
April	23 March
May	20 April
June	25 May
July	22 June

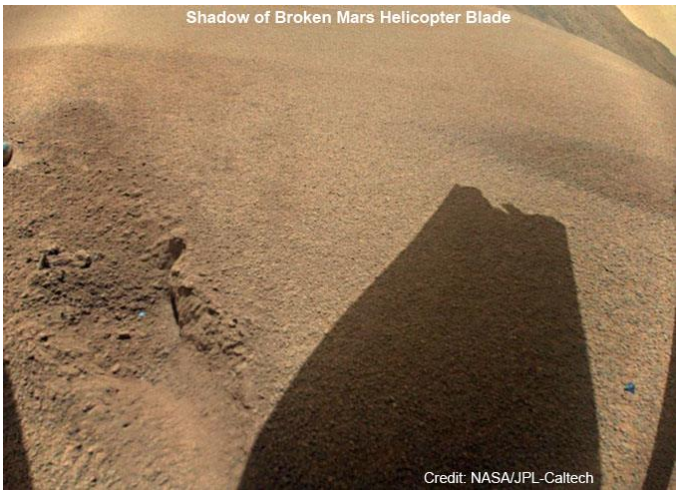
Help Wanted (Volunteering Opportunities)

- Communications Coordinator doing social media presence and announcements to members.
- Outreach coordinator, assistant coordinator, volunteer at outreach events

AstroSpace Update

March 2024

Astronomy and space news summarized by Don Lynn from NASA and other sources



Mars Helicopter – Last month I reported here that the Mars helicopter Ingenuity had completed 70 flights during its about 3 years on the Red Planet. On January 18 it made its 72nd flight. Unfortunately, it suffered a hard landing at the end of that flight, which broke the tips off at least 2 of the 4 rotor blades, and so is no longer able to fly. The first analysis of the hard landing indicates that the navigation camera probably lost track of where it was when it flew over a featureless sandy area. Ingenuity is otherwise functioning and can still take pictures and send them to Earth through the rover Perseverance's radio, as long as the rover stays within radio range of the helicopter. In a while the rover will move on to proceed with its mission. Ingenuity far exceeded its planned mission, proving not only that flight in the extremely thin air of Mars is possible, but that it could scout ahead for its rover and could visit places a wheeled vehicle could not reach. Work on future helicopters for Mars and Saturn's moon Titan is underway. Ingenuity was the first spacecraft sent to deep space that was built of off-the-shelf parts rather than parts designed and tested for use in the extreme vacuum, temperature and radiation environments of space. Weight restrictions forced Ingenuity's designers into this risky decision. For example, space-hardened computers weigh more than a pound, but the cell phone computer used in Ingenuity weighs half an ounce. The whole helicopter weighs only 4 pounds. The newest space-hardened computer uses about two-decade-old technology, because it took that long to harden and test it for space use. The result was that Ingenuity has far more computing power than that of all computers on all previous deep space missions combined. Ingenuity's cameras, batteries, etc. were also off-the-shelf parts. They turned out to be far less expensive than space-hardened parts too.

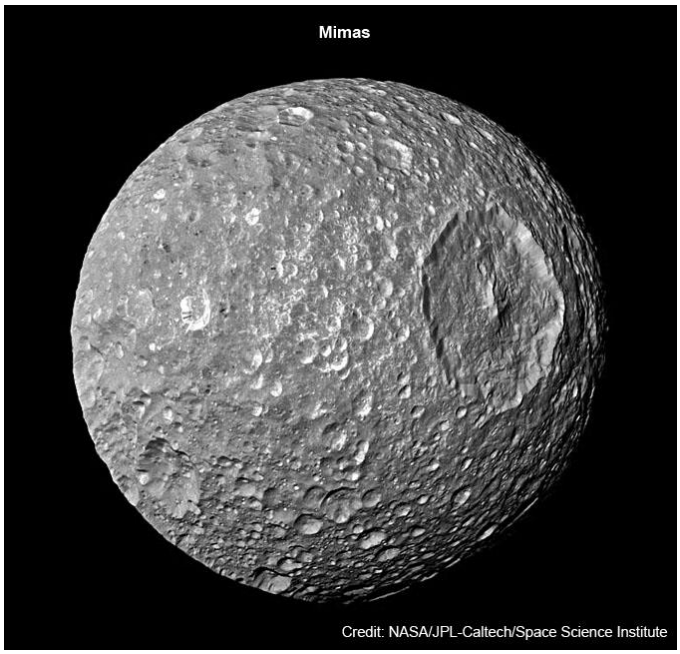
SLIM – Last month I reported here that the Japanese lunar lander SLIM had soft landed on the Moon but had a problem with its solar panels. Further investigation showed that SLIM had landed tipped over with its solar panels on the west side rather than its top, so the Sun was not shining on the panels. SLIM proceeded with its science measurements of its surroundings for about 2.5 hours, running off its storage battery, and then the spacecraft went to sleep due to low battery charge. A few Earth days later, as the Sun neared setting in the west, its rays struck the solar panels and SLIM awakened. It continued its work until about sunset. It is not designed to withstand the extreme cold of lunar night, but spacecraft controllers will try to contact SLIM in case it does survive until the Sun causes charging to resume in a couple of Earth weeks. SLIM well exceeded its goal of landing within 100 meters of its preselected point on the lunar surface, using a complex guidance system. That system used maps of the landing location, radar, laser altimeter and imaging data analyzed in real time.

A Lunar Lander named Odysseus was launched February 15. It was developed by the Intuitive Machines company under contract with NASA. It is attempting to be the first lunar landing of an American spacecraft in half a century. Its instruments are designed to test a landing navigation system, test a radio frequency propellant gauge, image the lander's rocket plume hitting the lunar surface, and study interactions of space weather with the lunar surface.

TDEs Discovered – Scientists have discovered 18 new nearby TDEs (tidal disruption events), where tidal forces near a black hole tear apart a star. Previously found TDEs were found in visible light or X-rays, but the new ones were found in infrared light. Only about a dozen nearby TDEs were known before the new discoveries. Apparently many TDEs occur in areas that are so dusty that they block visible light and X-rays. The discoverers searched through archived observations made by the NEOWISE infrared space telescope, after they had found their first infrared TDE. For the search they used a computer algorithm that looked for telltale signs of TDEs. Then they made follow-up observations to rule out other possible causes. The newly found TDEs seem to be located in all types of galaxies. The previously known TDEs were preferentially found in post-starburst galaxies, but that was probably because that type of galaxy has less obscuring dust. The new discoveries imply that the average galaxy has a TDE every 50,000 years or so. This matches better the theoretical predictions than statistics based on the fewer previously known TDEs indicated.

Earliest Black Hole – JWST observed a black hole so distant that we are seeing it as it was when the light left there only about 400 million years after the Big Bang. This makes it the black hole seen earliest (so far) in the history of the Universe. It is in a galaxy known as GN-z11, located in Ursa Major. The black hole has a mass a few million times the Sun's mass. This observation is challenging theorists to figure out how this black hole attained this mass so early. The black hole is consuming matter at a rate 5 times the Eddington Limit, the theoretical rate of consuming that should glow too brightly to allow further matter to fall in. Astronomers are continuing to search for even more distant black holes.

Mimas Ocean – A new study of Saturn's moon Mimas found that it likely has a liquid water ocean about 12-18 miles beneath the icy surface. Unlike some other moons with subsurface oceans, such as Europa or Enceladus, Mimas shows no signs externally of smoothing resurfacing, but instead is covered with old craters. The new study explains this by claiming that Mimas's ocean formed less than 25 million years ago and has not had time to cause resurfacing. Six other Solar System moons and two dwarf planets are thought to have subsurface oceans.



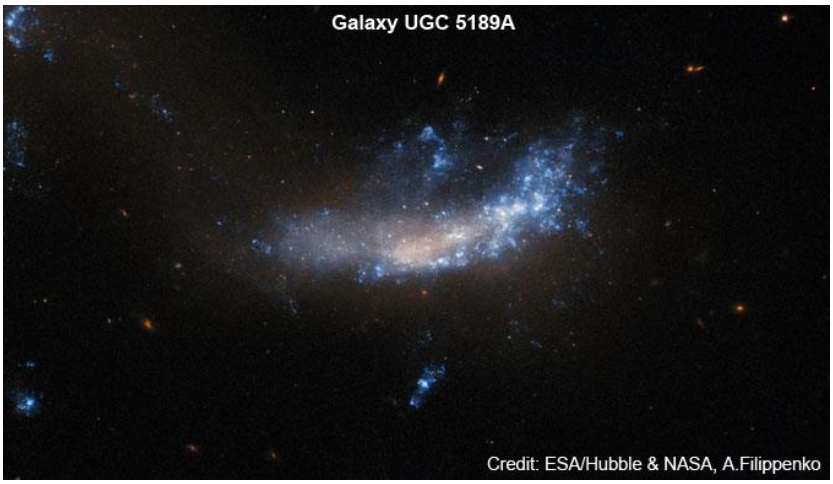
Exoplanet Water Vapor – Astronomers using the Hubble Space Telescope (HST) detected water vapor in the atmosphere of an exoplanet known as GJ 9827d. It is about twice the diameter of Earth, making it the smallest planet at which water vapor has been detected. It is about 800°F due to its proximity to its star. It is not clear whether water vapor is a small fraction or dominant in this atmosphere. The HST measurements were made spectroscopically during 11 occurrences of the planet transiting in front of its star. Astronomers would like to use the James Webb Space Telescope (JWST) to look for more constituents in the planet's atmosphere. GJ 9827d lies 97 light-years away in Pisces.

Exoplanet Atmosphere Loss – Astronomers used a spectrograph at the Keck Observatory in Hawaii to observe the exoplanet WASP-69 b, located 160 light-years away. They found that its atmosphere is being blown away by the high temperatures there. A tail of escaping atmosphere stretches at least 350,000 miles. It orbits a K-type star, somewhat smaller and cooler than our Sun. It is a gas giant, somewhat less massive than Jupiter, but orbits so close to its star that it is quite hot. The atmosphere being blown away amounts to an Earth's mass every billion years. However, this planet is massive enough that it will not be depleted of atmosphere within the lifetime of its star.

White Dwarf Exoplanets – JWST has imaged 2 exoplanets (actually exoplanet candidates, as they need to be confirmed), each orbiting a white dwarf star. Because a white dwarf is the remnant left after the red giant phase of a star's life, the new images likely show that planets can survive when their stars swell up as red giants. Planetary nebulas are thrown off during the red giant phase, so the planets apparently survived planetary nebula formation also. It is rare to find planets around white dwarfs because the popular exoplanet finding techniques don't work well with white dwarfs. The newly found planets have orbits roughly the size of Saturn's and Neptune's in our Solar System.

Binary Planet Confirmed – A study last year using JWST found in the Orion Nebula 42 pairs of planet-sized bodies that appear to be orbiting each other, and not orbiting a star. These are known as binary free-floating or binary rogue planets. New radiotelescope observations of one of these, known as JuMBO 24 [Jupiter-Mass Binary Object], confirmed it is indeed a binary free-floating planet.

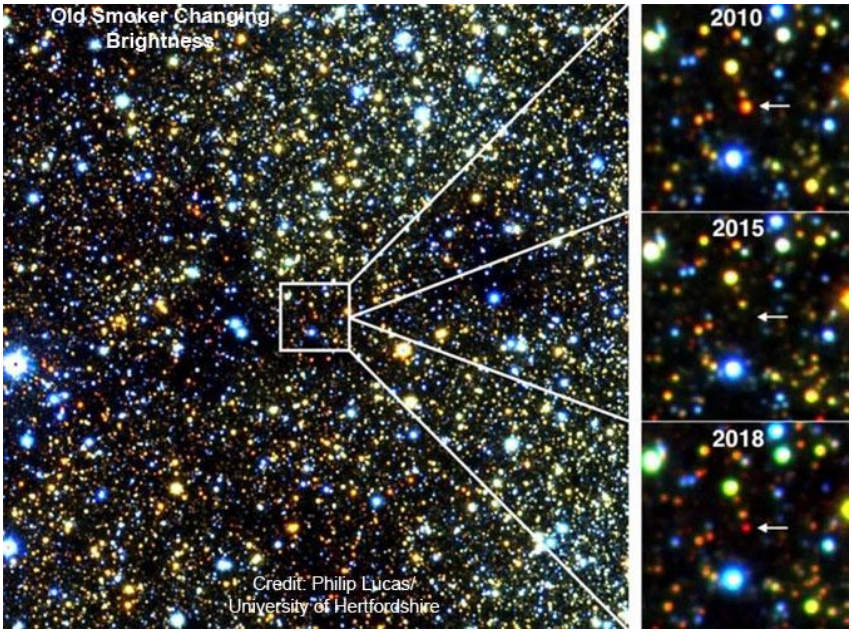
Supernova Aftermath – In 2010 an exceptionally bright supernova exploded in the small galaxy UGC 5189A, located about 150 million light-years away. HST has been monitoring the galaxy since then to see the aftereffects. In particular, astronomers are interested in how it is creating dust. Material blown out appears to cool and condense into dust. But the shock wave of the explosion bounced off some denser surrounding material, and after the bounce the shock wave is destroying some of the dust. It is believed that supernovas are major spreaders of dust, and that dust helps form planets around the next generation of stars. The supernova was at first classified as a Type IIn, but since has been considered a subclass of Type IIn because it was brighter than others in the class.



Dark Matter Filaments – A new study of the Coma Galaxy Cluster using the Subaru Telescope in Hawaii was made to map the location of dark matter. This was done by detecting weak gravitational lensing caused by the dark matter. Filaments of dark matter were found. Though it has been theorized that dark matter could clump in filaments, this is the first time such has been observed. Filaments of ordinary matter have been observed, and galaxies appear to form at intersections of these filaments. The dark matter filaments may also be linked to galaxy formation.

FRB Source – The cause of Fast Radio Bursts (FRBs) has been a mystery, though the origin of one FRB in 2020 was determined to be a magnetar, which is an extremely magnetic neutron star. X-ray and radio observations that were taken simultaneously with a 2022 FRB show that the magnetar underwent a glitch at the time the FRB was produced. A neutron star glitch is when its rotation speed suddenly changes slightly due to a shift in the arrangement of neutrons within it. So, the best theory of how FRBs are produced is that a magnetar glitch is the cause.

Old Smokers – A long-time survey in infrared, using the VISTA telescope in Chile, of stars in the center of our galaxy was made in order to find newborn stars. Infrared was used to better penetrate the galaxy's dust and the dust present in stellar nurseries. The survey also found a class of star that had never been seen before. The class has been dubbed old smoker stars. It consists of old stars that have run out of hydrogen fuel and therefore have transitioned into red giant stars. What sets them apart from ordinary red giants is that after quiet periods of many years they suddenly belch out clouds of dust and smoke. It is possible that they, like supernovas, are major spreaders of dust, feeding the next generation of stars and planets. 7 old smokers were found in this survey, located in the inner disk of the Milky Way. More study is needed to understand why these stars behave this way.



Early Black Hole Growth – JWST observed distant quasars, which are central black holes of galaxies that appear very bright because they are consuming great quantities of material. The observations focused on 350 galaxies with redshifts greater than 6, meaning that they are so distant that the light we are seeing left there less than a billion years after the Big Bang. 64 of these appeared to be active quasars. By ratio, the masses of the black holes in these quasars were larger compared to their galaxy masses than central black hole masses are in relation to their galaxies today. In other words, in the early history of the Universe, black holes grew more massive faster than galaxies grew more massive. However, bias in selecting the quasars may invalidate this conclusion; only quasars bright enough to be seen at this great distance were used in the study. More observations of early black holes will continue.

Zoozve – In February an asteroid was officially named Zoozve, perhaps the most unusual name yet for such a body. But then it's an unusual asteroid. It is one of only 9 known temporary moons (or quasi-satellites), that is, asteroids that appear to be orbiting a planet, but turn out to be in unstable orbits, so will eventually escape and orbit the Sun. Zoozve is temporarily orbiting Venus and will escape in about 500 years. When it was discovered in 2002, it was given the provisional asteroid standard designation 2002 VE_{68}, but its synchronization with Venus was not noticed until 2 years later. Many years after that, an artist named Alex Foster made a poster of the Solar System for kids and included this asteroid, but misread the designation, and put "ZOOZVE" on the poster. A podcaster saw this poster and brought the name "ZOOZVE" to the attention of the discoverer, astronomer Brian Skiff of Lowell Observatory, and eventually convinced him to support a proposal to the committee of the IAU for the official name. Its orbit is so eccentric that it comes close to Mercury's orbit and actually crosses Earth's orbit. It had a close approach to Earth in November 2002, which eased its discovery. The best estimate is that it has an average diameter of about 770 feet and is quite non-spherical.

Asteroid Sample – Technicians have completed removing all asteroid material from the sample container returned to Earth by the OSIRIS-REx spacecraft from asteroid Bennu. It took several months because two of the container fasteners were stuck. The total mass of the sample is 121.6 grams (about 4.3 ounces). The goal of the mission was to return at least 60 grams of asteroid material, so it exceeded expectations. Soon pieces of this material will be distributed to more than 200 researchers worldwide, while keeping a substantial amount for future research.

Meteor Predicted – An asteroid known as 2024 BX_1, only about a yard in diameter, smashed into Earth's atmosphere and broke up only about 3 hours after it was discovered on January 21. Astronomers had already predicted its time and location (west of Berlin) of impact, so the impact was observed as a rather bright meteor. Within days, meteorites were found from the fall. First analysis says the meteorites are likely aubrites, a rare light-colored type of achondrite. This is the eighth time an asteroid has been predicted to hit Earth before it hit.

Voyager 1, the spacecraft that flew by Jupiter and Saturn in 1979-80 and has been exploring the outer Solar System and beyond since then, encountered a problem in November that prevents it from sending data back to us. Spacecraft controllers say it is likely caused by a corrupted bit in the Flight Data Subsystem (FDS) computer. Controllers can't switch to the backup FDS computer, because it failed in 1981. The Voyager team is continuing to work on diagnosing and correcting the problem.

OCA Member Presented Paper to IAU Symposium

Reported by Mark Price

Ken MacLeod, an OCA and ASIG member, presented his paper titled "Forecasting Numbers of Post-Mission Satellites of Major Constellations, and Mitigation Methods" at International Astronomical Union (IAU) Symposium 385, Astronomy and Satellite Constellations: Pathways Forward, held on October 6, 2023. His paper has been accepted for publication in the symposium journal. In addition to OCA, Ken is a member of the IAU Center for Protection of the Dark and Quiet Sky, the International Dark Sky Association and the American Institute of Aeronautics and Astronautics.

Ken's study found that as many as 100,000 internet satellites are forecast to be orbited in large constellations by private and governmental organizations. As these satellites orbit the earth they deplete their station-keeping propellant, sometimes experience equipment failure or are damaged, in all cases ending their useful lives. As many as 16,000 of these "post-mission" satellites would be decaying towards re-entry at any given time, taking up to several years after their end of life. Post-mission satellite reflections and radio transmissions occur in the weeks or years they are spiraling downward before reentry, impacting the quality of earth telescope observations. Satellite post-mission interference will reduce the effectiveness of observations and therefore return on investment for existing and planned telescopic observatories such as Vera Rubin and Giant Magellan, and radio arrays such as ALMA and Meerkat.

The paper describes initial proposals from the satellite industry and regulatory bodies for mitigation of internet satellite effects on the Dark and Quiet Sky. Actions include satellite coatings for dimming, regulatory reduction in de-orbiting time spans in constellation populations, and reduction of satellite numbers in constellations. But these proposed mitigations of impacts on optical and radio telescopes do not result in a fully effective approach. For example, dimming only partially addresses the problems caused for optical telescopes, and post-mission satellites may lose attitude control, leading to bright glinting. De-orbiting time span reduction as required by the FCC is still rather lengthy at 5 years. Reduction of numbers of satellites may be very limited in its use, due to its negative impact on the satellite internet broadband mission.

Ken's paper forecasts advanced mitigation technologies that might include new systems for rapid de-orbiting of satellites, reducing frequency of failure by improving satellite reliability through redundant systems, and the deployment of service/clean up satellites to refuel or collect expiring satellites. The paper concludes that engineering and trade studies need to be conducted to define optimum mitigation methods and that a joint lab for testing and demonstration could be established to coordinate these efforts.

Another Look

March 2024
Dave Phelps

The New moon in March is on the 11th at 0358. The Full moon in March is on the 25th at 0983. Daylight Savings time begins March 10.

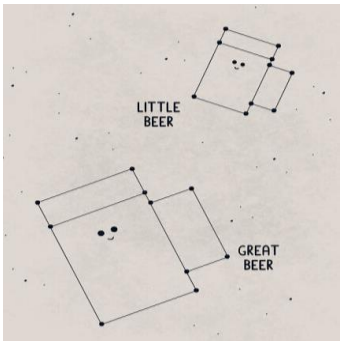
A Penumbral lunar eclipse is visible this month from the continental United States, Hawaii and eastern Alaska beginning about 2200 and ending 4 hours later Pacific Daylight Time. Maximum immersion will be at 0013 PDT. The moon will be quite high, it will be interesting to see if we are able to register any appreciable dimming.

March is the Full Worm moon, referring to the larvae emerging from the bark of trees at this time. Native American names include the Crow Comes Back Moon, the Eagle Moon, Goose Moon, Snow Crust Moon, Sore Eyes Moon, Sugar Moon and the Wind Strong Moon. In Spanish its Luna Llena de Marzo,.in German Vollmond im März, in French Pleine Lune de Mars, in Italian Marzo Luna Plena, and in Greek Μαρτίου πανσέληνος (Martíou pansélinos). In Gaeilge – Leo Mór agus Leo Mion.

The Vernal Equinox, i.e. the first day of spring arrives at 2004 PDT on Tuesday March 19. During much of March this year the Christian world celebrates the season of Lent. As a word, lent goes way back to the Old English and the Old German dialects and essentially means spring.

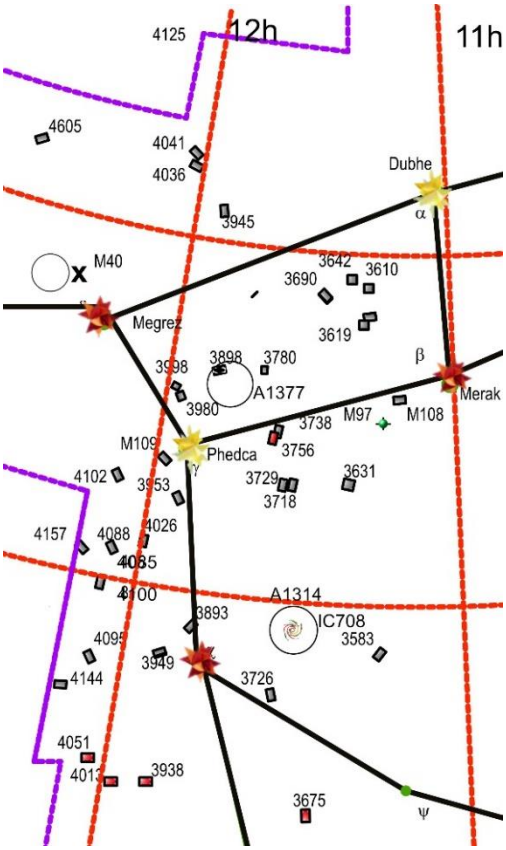
There are a number of lunar/planetary conjunctions this month including an occultation of Antares visible from Florida. Mercury and Neptune are being occulted on the 11th, visible from Antarctica, the So. Pacific and Central/So. America. On the 14th, the Pleiades will be less than ½^0 from the moon and on the 21st Venus will be a ¼^0 from Saturn.

I really wanted to talk this month about the bowl of the Dipper. Years ago I had the opportunity to spend an evening with Rev. Robert Evans of Hazelbrook, New South Wales. I believe he still holds the record for visual discovery of supernovas, over 40. He came to visit Southern California and I had the chance to spend an evening with him at the eyepiece of the 18" reflector at Ford Observatory near Wrightwood, CA. Robert was consummate at his profession and wanted to spend as much time as he could looking for supernova in the northern skies he couldn't see at home. He passed a year ago. So, I figured another evening galaxy hopping in Ursa Major would be a good idea.



Londyn Brown

I was hoping to remember Robert this month by concentrating on the bowl of Ursa and adding fun with the tail of Leo. It didn't work out. Most of the bowl's galaxies are too dim, you need some mirror and you need decent skies. Still, it's hard to resist. So this month and next month in April we will look at several historically famous galaxy clusters, many bright galaxies, Messier's and even a Caldwell. We will search for a few of the over 500 NGC and IC objects in Ursa Maj and the over 135 in Leo. To add a dollop of whipped cream to our galaxy pie we will also find two Abell galaxy clusters, one in Ursa and another in Leo.



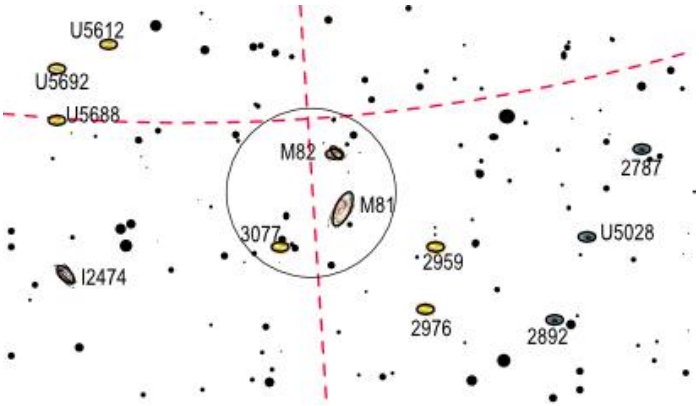
Ursa Major has two well-known galaxy groups and two Abell clusters. The M81 & M82 group is well placed for viewing this month and the M101 group is rising steadily. Abell 1377 and Abell 1314 are also well placed at 2100 this evening.

Dan Schechter ***https://ocastronomers.org/wp-content/uploads/2019/01/m081-02.jpg***

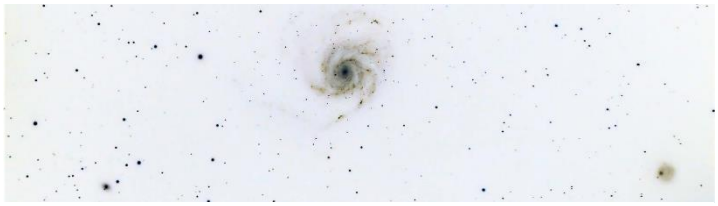
M81, also known as Bode's galaxy, is a big, bright centerpiece of a family of over 70 galaxies. It is 7th magnitude, so easy to see and can be viewed in the same field as M82 and NGC 3077. M82 is 8th magnitude and 3077 is 10th. We have all seen those beautiful images of M82 with red filaments boiling out from the top and bottom of the galaxy disc like a mad explosion.

Check out **https://apod.nasa.gov/apod/ap230120.html** and **https://apod.nasa.gov/apod/ap230802.html** .

Sadly, you won't see anything like that. In your eyepiece you can tell its oddly shaped and you may see a little bit of structure in M81 but count yourself successful if you can identify all three galaxies in your field. Just outside the field is 10th magnitude 2787. 10th magnitude 2976 is also easily seen. 2892 is dim at 13th magnitude and small. 2959 is nearly 13th magnitude, a tight spiral. Almost touching it is a nearly 15th magnitude lenticular (rod shaped) galaxy, 2961. The circle represents one degree.

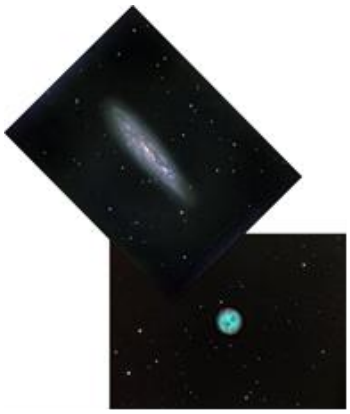


The M101 galaxy, called the Pinwheel, is the center for a number of group members. 5474 and 5477 are the closest members to 101. They are both dwarfs. 5474 has a big halo gravitationally bound to 101. You will find it at 11th magnitude. 5477 is near invisible at 14th magnitude. 5473 is 11.5 magnitude. 5475 is quite dim at 13th magnitude. 5485 and 5486 are close, but 14th magnitude. 5422 will be easier. It is a 12th magnitude lenticular galaxy with a quite bright nucleus and rather long arms. 5368 and 5443 are both near 14th magnitude, another tough find. The last galaxy on the chart is UGC 8837, a 13th magnitude dwarf that along with 5474 and 5477 are a family of interacting galaxies with M101. U8837 is a small active galaxy, in fact all three galaxies are pretty messed up by the huge gravity of M101.

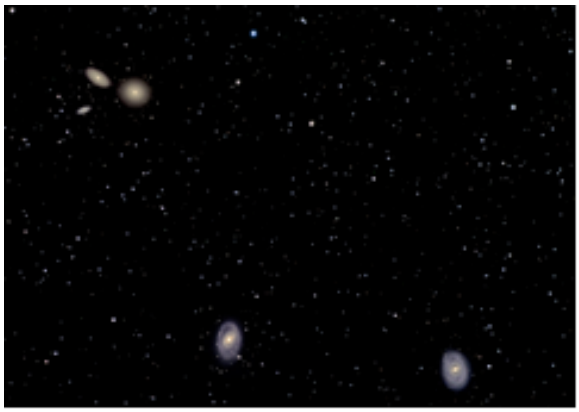


M101 from Jeff Malmrose in 2008 included N5473 and 5474
https://ocastronomers.org/wp-content/uploads/2018/12/M101.jpg

Other objects to look for in Ursa Major are M40, M97, M108, M109, Abell 1377 and Abell 1314.



M108 and M97 by Ray Stann
https://www.raysuniverse.space/



Donald Lynn 2010 m95-96-105
https://ocastronomers.org/wp-content/upload
2018/12/10.77112.16_06442_RGB_150secV2POvlysm.jpg

M109 (fuzzyat top) with Phecda. Credit to jgscience.org

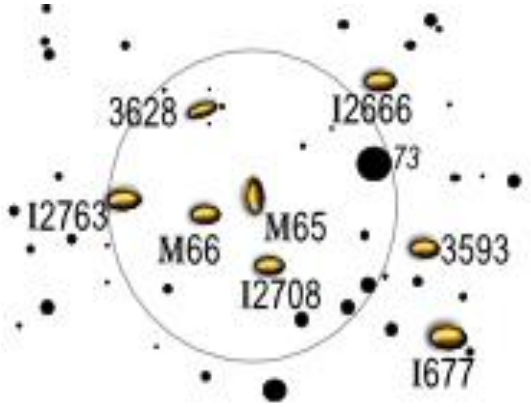
August Winnecke is a German astronomer who published one of the shortest catalogs in our literature. The Winnecke Catalogue of Double Stars has seven items listed, Messier 40 is number 4 on the list. The two stars are magnitude 9 and 10. M108 and M97 are less than a degree apart and can be seen in the same field of view.

M97 is the famous Owl planetary and M108 is much larger but about the same brightness, around 9th magnitude. M108 is a flat spiral showing us about a 30^0 face. The more mirror you have, the more blue M97 will appear.

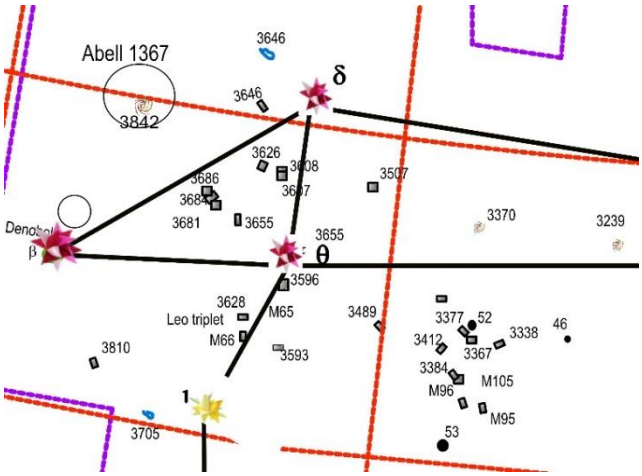
M109 is a spiral with about a 60^0 tilt. It is the same apparent size as M108 and about the same brightness. With a little bit of glass you should be able to see the rather apparent bar and stringy spiral arms. This rather over processed image I cropped from jgscience.org (a good one, check it out), shows M 109 and Phecda, γ Ursae Majoris.

Abell 1314 and 1377 are not among the popular Abells. A1377 is13th and A1314 is 15th magnitudes. A1377 does have a 3rd magnitude star near the brighter galaxies that can be used as a finder. In A1314 is the famous 14th magnitude "Papillon" galaxy, IC708.

Between Theta and Iota Leonis lies the Leo Triplet. The principal components are M65, M66 and NGC 3628. The three are all about 9th magnitude and will be visible as a group in your wide-angle eyepiece. They make an interesting study in galaxy formation. In this one field of view you have a 30^0 galaxy, M66, a 60^0 galaxy, M65 and an edge-on galaxy, 3628. Only a degree away from M66 is a smallish, 12th magnitude, nearly lenticular galaxy, N3593. Close by are four 14th magnitude galaxies that will reward careful search: IC's 677, 2666, 2708 and 2763. 2666 is brighter by half a magnitude. 2763, 2666 and 2708 are awarded only a couple of lines and no images in the NGC catalog. IC 677, however, is interesting since it has an even smaller, close companion galaxy, IC688. 677 is lenticular and active, it will be interesting what you see.

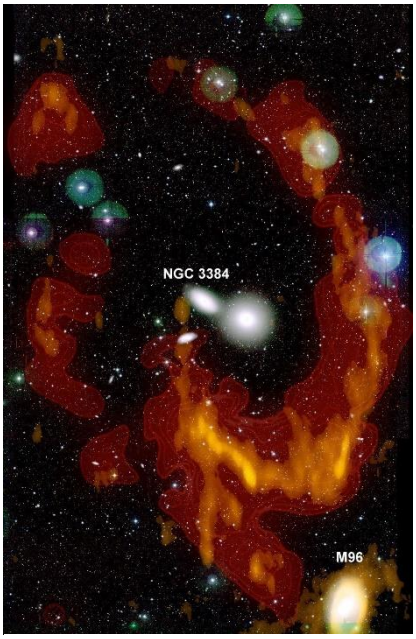


Perhaps a little more satisfying is the Leo II group, located in the triangle of the tail made by Beta, Delta and Theta. The main four galaxies are NGC's 3655, 3681, 3684 and 3686, all 11th and a fraction magnitude and all spiral of one form or another. Leo II could have two dozen or more members, but probably only a dozen or so visible in our larger amateur telescopes. One of the Patrick Stewart Caldwell objects, number 40, NGC 3626 is also right there. 3626 and 3632 are the same galaxy confused back in the day until reconciled by Caroline Herschel. 3626 is between 11 and 12 mag. Perhaps Sir Pat was stretching it a little when he chose this galaxy as number 40.



In the immediate vicinity of NGC 3842, and part of the Abell 1367 cluster are seven galaxies, all 14th or so, and all looking like what we think a galaxy cluster should look like. It will be great fun when you point your cannon to the tail of Leo.

It can be argued that the most popular galaxy group in Leo is near his midsection. There are over half a dozen galaxies 10th magnitude and brighter anchored by M95, M96 and M105. All the galaxies I have plotted are 10th and 11th magnitude or brighter, so galaxy hopping in your big Dob is right up your alley. Leo I is surrounded by a gigantic cloud of Hydrogen and Helium called the Leo ring. It was only discovered in the last 50 years or so and is not observable in our visual wavelengths. Messier 105 and its companion NGC 3384 are surrounded by a vast ring of neutral hydrogen gas. I took a Wikisky image and reduced it to the point where we can see the bridge of hydrogen gas between the two. You have to figure that that whole region of space is lying in a vast cloud of hydrogen and helium. We see the Leo ring as a ring but it is actually a sphere, the greater density of the gas on the sides being more visible and the center of the sphere blown out by the activity of M105, N3384 and N3389.



Leo Ring from http://www.rhysy.net/

The Lion flames. There the sun's course runs hottest
Empty of grain the arid fields appear
When first the sun into the Lion enters.
-- Aratos.

From the late Bronze and Early Iron Periods, to roughly the 1600's, at least in parts of the world, Regulus, the diminutive of Rex, was considered the "Ruler" of the heavens. This was true in Persia, Babylonia, India, and Arkkadia-ancient Greece. He was king because for much of this time the summer solstice was in Leo which coincided with rivers rising, and the summer sun heating the earth and ripening the crops.


Chauvet

The image of a lion up at the top can be found in early Egypt, inscribed on fountains and gates, on Paleolithic cave walls in Chauvet to Druid, Scots, Central American and Asian civilizations. Leo has been identified worldwide for thousands of years.

Dark Skys, Dave Phelps

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For Sale contact Ron Choi rchoi1983@gmail.com

- Orion StarShoot AutoGuider further reduced price $ 200
- Tele Vue 8mm plossl 1.25" eyepiece $ 80
-

For Sale contact Val Akins akins7821@gmail.com 949-301-5956

- Telescope: Orion's Sirius 8" Go-To Reflector, Focal Length: F6, 1200 mm, Case: for 8 x 6 OTA $ 450 reduced
  Mount: Sirius EQ-G Go-To Equatorial with tripod
  Controller: Synscan 42,000 Celestial object database
  Lens: Siriusplossl 26 mm
  Viewfinder: 8 x 50 mm Rt. Angle
  Note: Equipment is used, but all functional

For Sale contact David W. Pearson p.davidw@yahoo.com

- Star Splitter 20 inch Dobsonian telescope with servo-cat go-to capability $ 6000 obo
  Includes 8 eyepieces, laser collimator, telerad, plus more.
  The equivalent bought today from Obsessiont would be $15,385+shipping without extra accessories.
- Intes MK66 6" f/12 Maksutov-Cassegrain OTA includes rings/dovetail, case, finderscope, and diagonal $ 600 obo

These items are local pickup only. If interested, please send me email requesting a complete description.

For Sale contact Roger Mills 909-627-4122

- 8 inch pyrex mirror plank ground and polished to f/7 with polishing tool and materials $ 200 obo
- Fiberglass telescope tube 9.25 inch O.D., tube rings, equatorial mount, synchronous drive, counterweight, Book: "Making Your Own Telescope" by Allyn J. Thompson.
  The mirror has not yet been figured to parabolic shape

For Sale contact Nick McMillan wforacer@rocketmail.com

- Technical Innovations Pro-Dome Ten-Foot (PD10), includes three Wall-Ring-PD10 (WR10) which add ~48" height to the walls and making it 10' tall and 10" wide. $ 5000
- Digital Dome Works controller (DDW), hardware and software.
- Electric Dome Motors 10 (ED10), Electric Shutter Motor 10 (ES10), Shutter Auto Stop (SS1).
- Power Supply 10 (PS2E), ES Pulley upgrade (ESP), Wind Restraint System, Anti Sag Brace.

Pictures are on Flicker here: https://www.flickr.com/photos/123906448@N08/albums/72177720309596327/.
The dome and components must be picked up in Costa Mesa.

For Sale contact Barry Acton 714-603-2182 cell

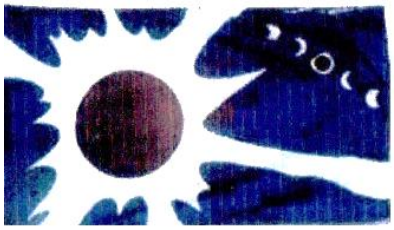
- Meade LX200R GPS & Tripod (with original box). New is priced around $5,500 $ 2000
- Meade Zero Image-Shift Electronic Micro-Focuser
- Meade AutoStar II Hand Controller, manual
- Eyepiece Meade Meade 26mm Plossl 5 Element 1 1/4"
- 1.25" 90° Mirror Star
- Other accessories that came with the telescope…

- Meade SF #1200 10" Solar Filter $ 50

I am the original owner, and it has been for about 15 hours. It is in extremely good condition as it has sat inside the house when not in use. Everything is in perfect condition.

For Sale contact Kandra Kargo teapotsagit@earthlink.net 714-349-9137 cell

- Total Solar Eclipse Flag is back! Take one with you to Texas (or Mexico) next April 2024! $ 45 + S&H
  Limited supply from Teapot Sagittarius. American made. Call or text for more information and to order.



For Sale contact Jerry Floyd jlfloyd720@gmail.com

- Celestron CG-11 scope (Losmandy G-11 Equatorial Mount with Celestron C-11 Telescope) $1000
  No tripod
  High-precision brass worm (purchased as upgrade from Losmandy), Gemini-1 control unit including motors, Counterweights, Finder-scope, Telrad finder, dew shield for telescope

Originally purchased as a single assembly in 1996; little used in the past few years but in good shape
Can demo if interested, but you would have to come to my observatory at the OCA Anza site
These items are for local delivery in Southern California only. If interested, contact me for further information.

For Sale contact Richard Brennan 562-480-7215 cell dickbrennan101@yahoo.com

- Losmandy D-series dovetail rail and adjustable rings. $160
  DM8 + DR100 with 2 radius blocks. r mounts and rings for same.
- Meade Equatorial SuperWedge, hand-knobs for all adjustments, azimuth adapter for tripod, $175
  central nut with compass, LX200 base hex mounting screws, and Teflon tripod washer
  10" dia. x 1/8" (Jim's Mobile).
- QHY 5L-II-M Planetary/Guide CMOS camera, like new. $70
- Meade 644 flip mirror $70
- SBIG ST-237 cooled camera with filter wheel, processor, software, relay box, and DB-25 cables. $60
  The Windows XT computer is what is missing. SBIG hasn't supported this cooled camera for many years.

For Sale contact Vance Tyree 626-372-4856 vctyree@verizon.net

- iOptron CEM60EC mount with encoder on RA axis, hard case $2500
- iOptron model 8030 portable pier 48 inch height
- iOptron 2 inch tripod, model 8021ACC with carry bag
- 21 lb counterweight

The mount handles optical payloads up to 60 pounds. It has unguided periodic error of 0.5 arc-sec (RMS). I used this mount without auto-guiding with sub-exposure times of up to 300 seconds without showing any star trailing in RA or DEC when the polar alignment was within 1 arc-min or better. Closest equivalent mount today is CEM70EC which costs $4400.

The portable pier has a 6" diameter vertical tube (48 inches tall) equipped with removable legs and turnbuckle braces making a very rigid structure that has a 46 inch maximum leg spread and screw jacks for leveling.

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