SIRIUS ASTRONOMER

www.ocastronomers.org

The Newsletter of the Orange County Astronomers

September 2023 Free to members, subscriptions $12 for 12 issues **Volume 50, Number 9**

This is the open cluster M11 some times called the Wild Duck cluster. It was imaged by Jerry Floyd in July 2022 at the club's Anza site using a Celestron RASA-11 telescope and ASI2600MC color camera.

Upcoming Events - free and open to the public

Beginner's class	Friday, 6 October at 7:30 to 9:30 PM **ONLINE** This is session 2 of the class: Covers equipment used to observe the night sky.
Club Meeting	Friday, 8 September at 7:30 to 9:30 PM **In person** at Chapman University and **ONLINE** "What's Up?": John Garrett from TVA Main speaker: Shane Larson from Northwestern University on the topic "THE SHAKING COSMOS: Observing the Universe in Gravitational Waves with LISA".
Open Spiral Bar	Saturday, 9 September 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, 16 September 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

In case you missed it, we had some excitement out near our Anza site since I wrote my last column. On July 27, 2023, the Bonny Fire started close enough to our site that, had the wind had been in a different direction, it could easily have burned over the site. Fortunately, wind ultimately drove it away from us and into a more unpopulated area. Although it burned 2322 acres over a span of 13 days before it was fully contained, it destroyed only one structure. We didn't have access to our site for about a week as it sat within the mandatory evacuation zone. This caused some nervousness, but when members were finally allowed back on the site, they found no signs of damage from embers or unwanted visitors.

We were very fortunate this time, but it's a reminder that we need to be vigilant and keep our vegetation under control, so our site is defensible if there's any further fire out there.

More Interesting Weather…

As I write this, we're under a storm watch as Hurricane Hilary, which reached Category 4 status at its most intense, heads toward Southern California as a still-impressive tropical storm. The eye is expected to pass over or at least close to Temecula on August 20, which would be interesting to observe if I was in Temecula, but I don't plan to make my way there just for that experience. Nobody knows quite what to expect right now, other than rain accompanied by wind; the last time we had a weather event like this was in 1939.

Which, it turns out, my father, who is now 98, remembers well. He was about 14 at the time, and he and his family were staying in South Laguna when the storm struck. He remembers that the ocean was so rough the whitecaps where the wave tops were blown into froth by the wind couldn't be seen individually, there were so many of them. Some of the waves that came in were so big they were breaking over the top of the cliff at Table Rock, which is pretty high, and he recalls seeing waves breaking against the cliffs at the southern end of Catalina. Newport Harbor got very rough and a lot of boats sank. He said that there was a commercial fisherman who rescued a lot of people whose boats had sunk in the channel for Newport Harbor, and it seems likely there were others who couldn't be rescued. My grandfather had built a small boathouse into the cliff in a cove near Table Rock, and after the storm the front of the boathouse was gone but their boat was undamaged. A similar boathouse that was a short distance to the south was totally destroyed, including the boat it protected. That was definitely a memorable storm.

Needless to say, I hope our tropical storm isn't nearly as interesting as that one. By the time you see this, the storm should be just a memory, and hopefully none of you suffered much damage from it.

Astronomers, by the nature of their hobby, generally develop an interest in weather and events like this certainly increase that interest level. Even without tropical storms, we have high winds, including micro-bursts, at Anza often enough that we make sure that any proposed structure for the site is built solidly enough to withstand those conditions. For those observatories with roll-off roofs, like the club observatory, some way of keeping the roof from blowing off needs to be included in the design, and most do that with steel tie-downs that secure the roofs when they are closed. Winds over those roofs can generate a lot of lift, and we had a wind event at Anza a few years ago that pulled on an observatory roof hard enough that it straightened out the hooks on the tie-downs and blew the roof off the observatory. Somewhat miraculously, the roof landed without hitting any other structure and without causing itself too much damage. It was restored to its proper location and function with much less trouble than we would generally expect, and continues to do its job, though with much sturdier tie-downs. It was a lesson for all of us that we need to be careful not to underestimate the winds out there, even under normal conditions.

Farewell to Jan Schones

We learned from Gary Schones that his wife, Jan, succumbed to her long-standing heart condition and, sadly, is no longer with us; both have been long-standing members of the club and Gary has been a Board member for many years. Long-time members who were out at Anza frequently may remember her coming out there with Gary in their RV, with their dogs and often a grandchild or two. I remember many happy visits out there with her and was sorry when she stopped coming because of all she had going on at home. Though a member, she wasn't an astronomer herself, and very fortunately for us, never grudged the time and energy Gary devoted to the club over the years, particularly in improving the Anza site, and to his other astronomical activities.

The last time I was able to have a long visit with Jan was shortly before the 2017 total eclipse, when we spent an afternoon with Gary and Jan at Joshua Tree. Gary and Alan were making sure their equipment was ready for the eclipse and working on their imaging skills (imaging the sun is definitely different from imaging other astronomical objects), and Jan and I had a long time to talk and enjoy each other's company. It was a great afternoon, followed by a fun dinner together, and we had plans for meeting in Idaho for the eclipse that, unfortunately, fell through because of her heart condition.

Jan was a lively, funny, warm-hearted person who loved her family and delighted in the activities of her children and grandchildren. I'm glad she had time to spend with them in the last few years. She'll be missed, and Gary has our deepest sympathy.

I hope you're all staying well and safe, and that you're having opportunities to indulge in your favorite astronomical activities in spite of the weather and other challenges we've all been facing!

This is where the Bonny fire started on 27 July.
This picture was taken from the upper pads area of our site.

It burned towards the left (mostly East), driven by prevailing winds. The burn strip, seen here on the bottom of Beauty Mountain, started narrow and became wider towards Anza.

Astrophysics Special Interest Group

Mark Price
ASIG Coordinator

Over the last year the Astrophysics Special Interest Group (ASIG) began taking field trips as well as continuing our regular meetings on the third Friday of each month at the Heritage Museum of Orange County (HMOC).

Our first field trip was a docent led day tour of the historic and very scenic Mount Wilson Observatories in August 2022. The highlight of this tour was a detailed look at the Observatories housing the 60 inch and 100 inch reflector telescopes. The docent was extremely knowledgeable technically and answered all our questions about the Observatory telescopes, other site facilities and ongoing scientific activities at Mt. Wilson. We took a break during the 100 inch telescope facility tour for a Western Amateur Astronomers, Bruce B. Blair Award Ceremony for Timothy Hogle who is a founding member of OCA.

In March 2023, we toured the Goldstone Deep Space Communications Complex near Barstow, CA., which is collocated with Fort Irwin. Goldstone's facilities are spread out over a 32,411 acre site in the Mojave Desert requiring we drive from facility to facility. Goldstone is part of the NASA network of radio telescope facilities (including similar stations near Madrid, Spain and Canberra Australia) that are used for NASA space satellite communication and control. The three earth sites are separated by about 120 degrees in longitude so that an orbiting satellite they are in communication with or controlling will always be in range of one of the three earth stations. We were required to have a docent led tour on this NASA Site and their docent was very knowledgeable of facility installations, technology and operations. The highlight of this tour was our visit to the 70 meter (about 240 feet in diameter) radio telescope and the control station that combines radio telescope operations and coordination with the two overseas facilities. We met with the control room Supervisor who answered all our questions about radio telescope technology, operations and coordination activities with the other sites.

Our April meeting featured Lorna Pecoraro who presented "Things that Fly Around the Sky", objects visible with the eye or simple optical devices like binoculars, including the Moon, meteors and asteroids and satellites. The May meeting featured a presentation by Dave Snead on the Anatomy of a Black Hole, using KerrSlice simulation software for graphic presentation of his findings.

In June 2023 the meeting featured the spectrographic work of ASIG member George Robinson. George presented an overview of spectroscopy and showed us some of the results of his work for specific astronomical targets. George has extensive information about spectrography on his personal website http://www.palmiaobservatory.com/. If you want an overview or more in-depth information this is a great place to start.

We are having an interesting 2023 of new and traditional ASIG activities. Please join us at our next meeting at HMOC in September.

AstroSpace Update

September 2023

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

Water Vapor Found – Scientists used the James Webb Space Telescope (JWST) to observe the PDS 70 exoplanet system. Two planets were already known to orbit between an inner and an outer disk. The system is only 5.4 million years old, so is still forming planets. The new observations found water vapor in the inner disk, which is located at such a distance from the star that rocky planets could form there. This is a surprise because computer simulations of the formation of rocky planets usually result in very little water on those planets. This was thought to be because the ultraviolet light of a star should break up water in the close regions, where rocky planets form. This observation may imply that the Earth could have formed with its oceans, rather than forming dry and accumulating water later. Theorists are now working on explaining how the water formed in the PDS 70 system, and how it survives the ultraviolet from its star. Further JWST observations are planned to better understand this.

Star Formation – Herbig-Haro 46/47 is a known star-forming region with jets and has been studied by many telescopes. New observations using JWST showed the region with higher resolution than previously seen in near-infrared light. The jets influence just how star formation proceeds, so studying them will help to better understand star formation.

Heartbreak Stars – A computer simulation of close binary stars has been able to match observations of the brightness variations of a pair known as MACHO 80.7443.1718 (so called because it was discovered by the MACHO program while it was searching for effects of dark matter). The simulation showed that when the pair of stars approaches each other closely, an enormous tidal wave is gravitationally raised on the larger of the pair of stars. The tidal wave reaches a height about 3 times the diameter of our Sun. The pair of stars complete their orbit about each other in about a month. The class of binary stars showing variations in brightness caused by elongated orbits is known as heartbeat stars. This pair far exceeds the size of brightness variations seen in any heartbeat stars, and has been dubbed a heartbreak pair, due to the tidal wave actually breaking like a wave breaking on a beach. Typical heartbeat stars vary in brightness by much less than 1%, but the heartbreak star varies by 20%. About 20 of the known roughly 1000 heartbeat stars have substantially larger brightness variations than typical, but none of them are as extreme as the heartbreak star. The discoverers plan to search for more heartbreak stars.

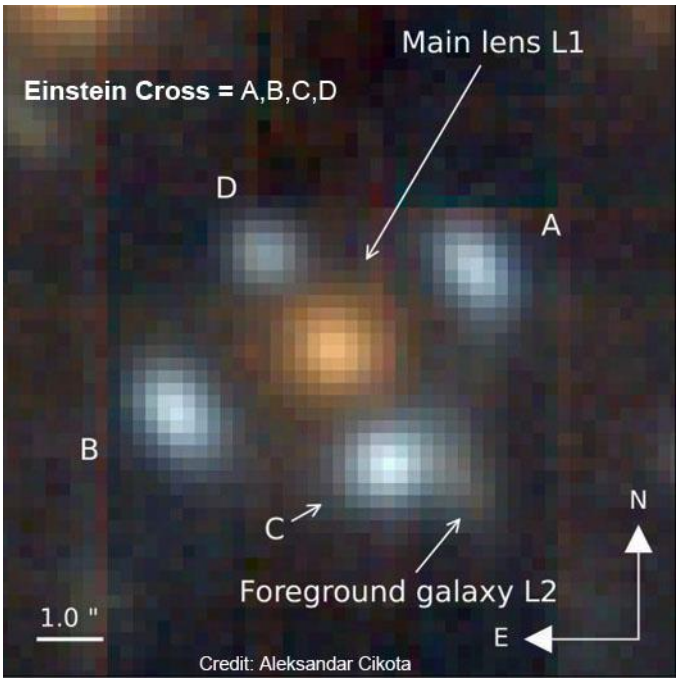
Scorched Exoplanet – The Hubble Space Telescope (HST) was used to observe the young red dwarf star AU Microscopii (AU Mic). Young red dwarfs are known to emit super-flares that have up to 1000 times the power of flares on our Sun. It is believed that the super-flares are powered by tangled magnetic fields. The innermost exoplanet is known as AU Mic b, and it is being scorched by such super-flares, such that its mostly hydrogen atmosphere is being stripped away. But the HST observations showed that the stripping is not steady from one orbit to the next but occurs in bursts. Strangely the stripped material was seen orbiting ahead of the planet. The AU Mic system is only 32 light-years away. AU Mic b is so close to its star that its orbital period is only 8.46 Earth days.

Unusual Exoplanet – A low-mass star known as TOI-4860, located in the constellation Corvus, has been found to have a Jupiter-size exoplanet orbiting it. It is unusual for a low-mass star to have such a high-mass planet. This is because low-mass stars tend to form with low-mass planet-forming disks, which tend to form low-mass planets. The planet is also unusual in that it is richer in heavy elements than is typical for exoplanets. That richness could have helped the planet accumulate more mass during its formation. The planet was found by TESS, an exoplanet finding space telescope and confirmed using ground-based telescopes. The planet orbits quite close to its star, but that star is so dim that the newly found planet is classified as a Warm Jupiter rather than a Hot Jupiter.

Hottest Brown Dwarf – Astronomers have discovered the hottest known brown dwarf, located about 1,400 light-years away. The cause of this high temperature is that the brown dwarf is in a very close orbit about a white dwarf star whose light heats it. It is roughly 3,000°F hotter than the surface of our Sun on the side of the brown dwarf facing the white dwarf. The dark side is about 11,000°F cooler than the lighted side. A brown dwarf is an object more massive than a gas giant planet, but without enough mass to sustain the nuclear fusion that powers ordinary stars. However brown dwarf diameters are roughly the same as gas giant planets. So, studying this hot brown dwarf may tell astronomers more about how Hot Jupiter planets work. It is easier to study than Hot Jupiters because it is brighter in comparison to its star and therefore is less overwhelmed by starlight, its temperature is extreme, and it is physically large compared to its star.

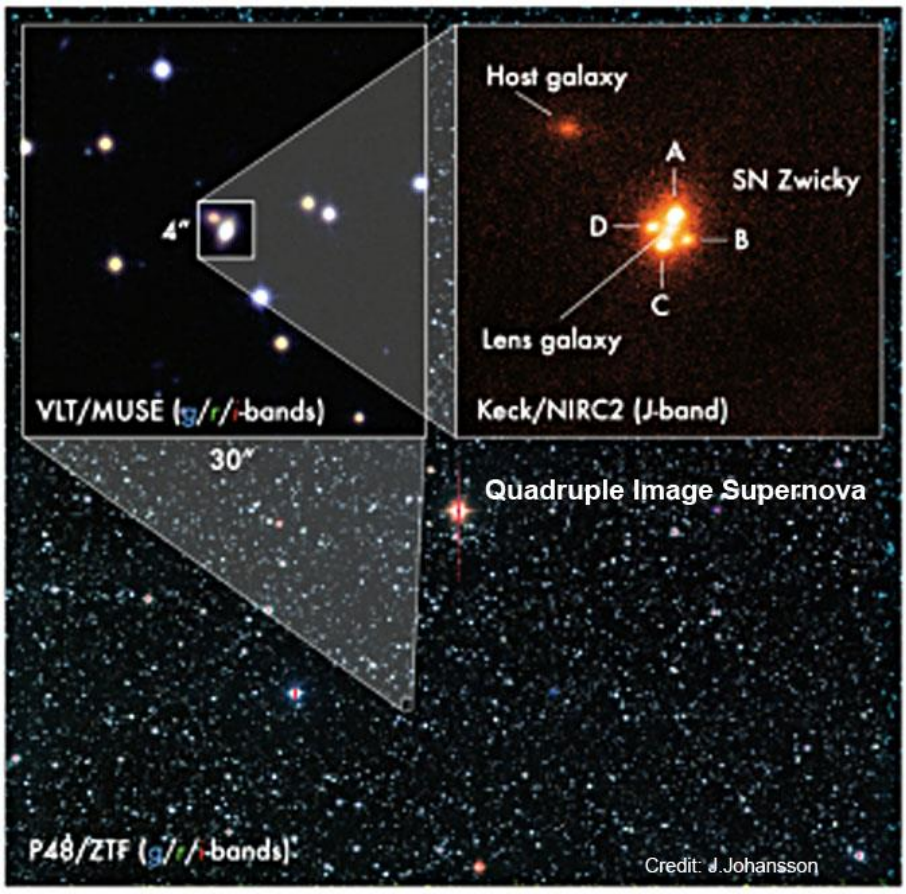
Unusual GRB – Gamma-ray bursts (GRBs) typically last from a tiny fraction of a second up to several minutes. During that time, they are far brighter than a supernova. They are thought to be caused by one or two stars collapsing into a black hole. An unusually long GRB was observed to last more than 16 minutes. It was also unusual in that it peaked twice. One possible explanation is that the GRB light passed by an intervening massive object and was gravitationally lensed into a double image; thus it might seem to last twice as long and be double peaked. Its afterglow in wavelengths of light other than gamma rays was fairly typical of other fairly long GRBs.

An **Einstein Cross** is a quadruple image of a distant object caused by the gravity of a massive foreground object gravitationally lensing the distant object. If the lensing (foreground) object is spherical, then an Einstein Ring is produced by gravitational lensing, but if non-spherical then a multiple image (often a quadruple) is produced. Einstein Crosses are fairly rare. A new one has been discovered in images taken by the DESI camera at Kitt Peak in Arizona. The lensing object is a galaxy at 5.998 billion light-years distance and the distant object is a galaxy 11.179 billion light-years away (as measured in light travel time). A lump aside one of the 4 images was found to be a faint galaxy at only 4.2 billion light-years. The lensing galaxy is part of a cluster of at least 8 galaxies, but the other galaxies in the cluster appear to be too far out of the line of sight to have much effect on the lensing.



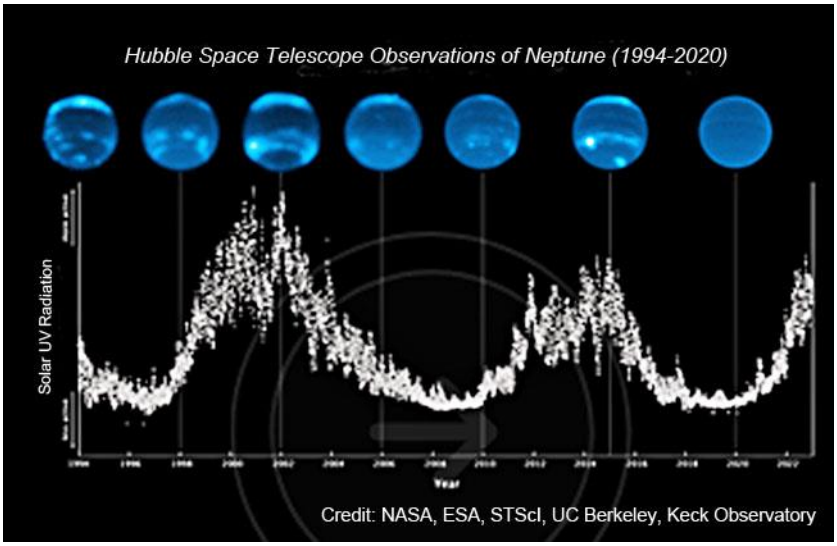
Meteorite Sources – A team of scientists studied 38 meteorites whose trajectories had been imaged in order to see if they had orbits similar to known near-Earth asteroids. Matching characteristics, they identified 12 meteorites that are likely pieces that came off known near-Earth asteroids. These pieces could have been dislodged by collisions, sublimation of ices, spin, or fragmentation from heat. Evidence pointed to at least ¼ of the fragmentation occurring after asteroids were diverted from the asteroid belt to near-Earth orbits, but others fragmented in the asteroid belt and were then diverted. Likely resonances with Jupiter cause such diversion.

Quadruple Supernova Image – The same phenomenon that produces an Einstein Cross was found to cause a quadruple image of a distant Type Ia supernova. That supernova, known as SN 2022qmx, was discovered by the Zwicky Transient Facility (ZTF) and found in high resolution follow-up images from the Keck Telescope to be quadruple. Because gravitational lensing brightens objects, Type Ia supernovas that are lensed can be seen at greater distances than unlensed ones. ZTF is the project using the 48-inch Schmidt camera at Palomar to repeatedly image much of the night sky to find changes.



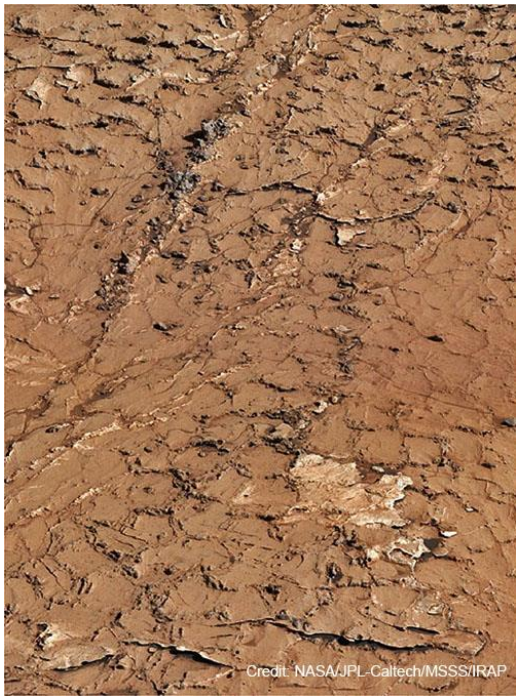
Nuclear Rocket – NASA in cooperation with the Defense Advanced Research Projects Agency (DARPA) has awarded a contract to Lockheed Martin to develop a nuclear-powered rocket engine. It would use Uranium to heat hydrogen fuel. The project is named DRACO and is scheduled to be tested in space in 2027. Theoretically such a rocket could cut the travel time to Mars from the current 6-9 months (using chemical rockets) to 1.5-3 months.

Neptunian Cloudiness – A study of high-resolution images of Neptune taken over a span of about 30 years shows that the cycle of increasing and decreasing clouds on Neptune synchronize with the 11-year sunspot cycle but delayed by about 2 years. The images were taken by the Hubble Space Telescope, the Keck Observatory in Hawaii, and the Lick Observatory in California. Neptune's cloudiness does not seem to relate to the seasons on that planet, which change about every 41 Earth years. The best theory explaining this is that the Sun's ultraviolet light, which changes with the sunspot activity, causes photochemical changes in the planet's atmosphere to produce cloudiness with those changes taking a while, explaining the 2 year lag. The study also found that the planet's cloudiness affects the amount of sunlight reflected by the atmosphere.



Mars Rotation – The spacecraft InSight is famous for its Mars seismometer, but a lesser-known investigation performed by InSight, called RISE, has announced some surprising results. Radiotelescopes on Earth tracked the location of InSight extremely precisely as it rotated with Mars. The planet's rotation was found to be speeding up, resulting in Martian days being shorter by a fraction of a millisecond every year. From RISE data scientists calculated a good estimate of the size of the planet's core, and determined the core is layered rather than uniform in density. It is strongly possible that there are liquid layers in the core.

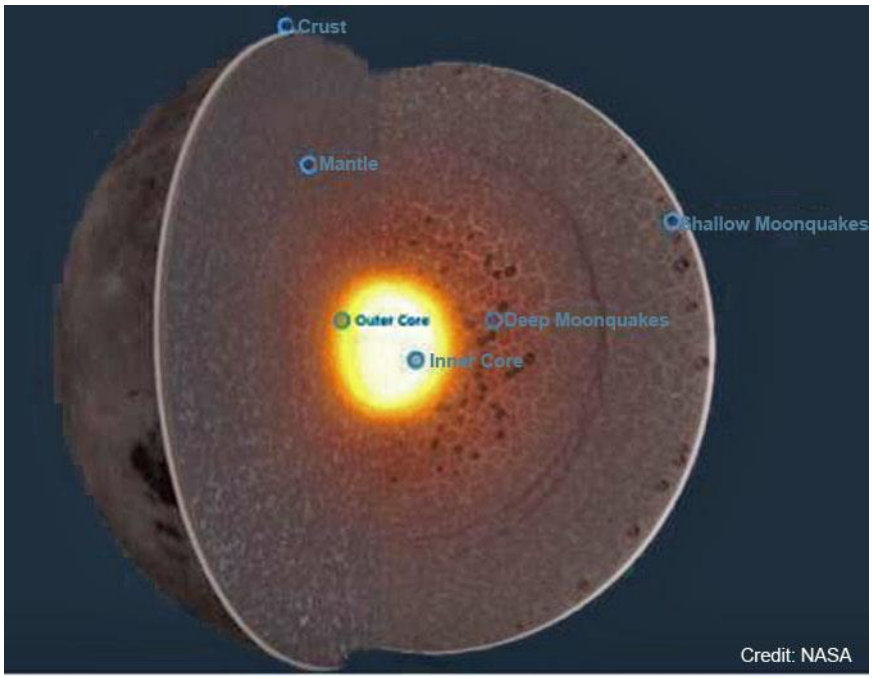
Martian Wet/Dry Cycles – A pattern of cracks found in mud on Mars by the rover Curiosity has been judged by scientists to have formed by alternating wet and dry conditions that stretched over many years. This must have occurred billions of years ago because the planet has been quite dry for billions of years. A salty crust formed upon the mud cracks, which preserved them until now from wind erosion. Such wet-dry cycles may have been conducive to the formation of microbial life during this early period of the history of Mars.



Ingenuity – On July 22, the Mars helicopter Ingenuity went into "LAND NOW" mode during its 53rd flight and so completed only a little over half of the planned flight. The flight was to take images that will be used to plan activities of the rover Perseverance. Likely the cause of ending the flight early was that the navigation camera dropped some images that it needed to continue navigating. A flight 54 plan was developed to test flight capabilities, and Ingenuity completed it successfully in early August. Spacecraft controllers declared the helicopter ready to resume regular flights.

Voyager 2 Communication Restored – A wrong command was accidentally sent to Voyager 2 that resulted in the spacecraft pointing its dish antenna away from Earth. NASA ganged multiple antennas on Earth together for increased sensitivity and managed to detect the weak signal from Voyager, demonstrating that the spacecraft appeared to be operational except for the antenna pointing. Voyager is programmed to reestablish antenna pointing every so often, so if left alone, the problem was expected to right itself October 15. But spacecraft controllers tried another approach by blasting the loudest possible radio signal from the Australian dish, commanding Voyager to repoint its antenna. After waiting 37 hours, the round-trip speed-of-light time to the spacecraft, Voyager answered loud and clear.

Lunar Interior – A new study of data from the seismographs placed on the Moon by five of the Apollo missions, and also using data from the GRAIL lunar orbiters and the Lunar Laser Ranging (LLR) experiment, has given astronomers a new picture of the interior of our Moon. The best fit to observations is a solid inner core nearly the density of iron with a 160 mile radius, surrounded by a liquid outer core with a 225 mile radius, and a low-viscosity zone in the inner mantle. In the low-viscosity zone dense matter sinks and lighter matter rises. This structure also explains the minerals found at ancient lunar volcanoes. The structure also fits with the withering long ago of the Moon's global magnetic field as the core cooled.



The GRAIL pair of spacecraft precisely mapped the gravitational field of the Moon. LLR bounces laser light off reflectors left on the Moon by Apollo missions and by two unmanned Russian missions to measure the position of the Moon as it orbits with extreme precision.

Response to COVID-19 Crisis

Meeting in person:	Astrophysics SIG, Anza star parties, and **monthly club meeting**
Meeting via Zoom:	**Monthly club meeting**, Beginner's Astronomy class
Coming soon:	Orange County Star Parties
Cancelled until further notice:	AstroImaging SIG
Check with Coordinator:	Outreach events

Help Wanted (Volunteering Opportunities)

- Communications Coordinator doing social media presence and announcements to members

From the Editor

Due dates for submission of articles, pictures and advertisements

Issue	**Due date**
October	23 September
November	21 October
December	18 November
January 2024	**21 December** (early due date because of holidays)

Advertisements

Buy, Sell or Trade some of your gear? This is where club members can place advertisements. Please contact the editor at newsletter@ocastronomers.org to place an advertisement or to learn more about placing one. There is no cost to club members for non-commercial advertisements in the newsletter.

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 Michael Newman mnewman2112@gmail.com

- Pad lease for LP-12 in Lower Pads section and the pier upon it $ 1000

It includes a pier that is very nicely aligned and can support a C-8 up to a C-14 I believe although the new owner may need to drill new holes. For questions and to express your interest in the pad, please contact me via email.

For Sale contact Bill Prats b.bill.p@gmail.com

- QHYCCD PoleMaster Camera Adapter for Losmandy GM811xx Mount, IEQ30/IEQ45 # 020038 $ 30
  3 Pieces, Bright red finish, no scratches
- Losmandy Servo motor/Gemini 2 cables (pair) recent & hardly used Make offer
- Losmandy Gemini 2 Hand Controller, recent & hardly used Make offer

Contact Bill Prats b.bill.p@gmail.com Shipping is extra. All items can be picked up in Huntington Beach.

For Sale contact Eric Mjolsness emj@uci.edu

- Mars Hill Pad # MH-05 OCA license is up for sale. Includes solid equatorial pier. $ 2300 obo
  Price in 2010 was $2300. I am seeking that amount back or best offer.

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 $ 852 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 Ami Dvir amiaddvir@gmail.com 949-294-1073

- Eyepiece Celestron X-CEL : 12mm,9mm,7mm, with boxes and all $ 170
- Eyepiece Meade 5000 PWA 28mm [like new in the box], list price is $330 $ 220
- Eyepiece Meade 5000 PWA 16mm [like new in the box], list price is $190 $ 120

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

- Star Splitter 20 inch Dobsonian telescope with servo-cat go-to capability $ 8000 obo
  Includes 8 eyepieces, laser collimator, telerad, plus more.
  If the equivalent was bought today from Obsession, it would be $15,385+shipping without extra accessories
- Intes MK66 6" f/12 Maksutov-Cassegrain OTA includes rings/dovetail, case, finderscope, and diagonal $ 800 obo

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

For Sale contact Nick McMillan wforacer@rocketmail.com

- Technical Innovations Pro-Dome Ten-Foot (PD10), includes three Wall-Ring-PD10 (WR10) $ 5000
  which add ~48" height to the walls and making it 10' tall and 10" wide.
- 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.

Another Look
Lyra

Dave Phelps September 2023

September 15 - New Moon. September 29 - Full Moon, supermoon
The autumnal equinox occurs at 06:43 UTC on September 23. (2343hrs. 9/22/23 west coast time).
There is a Lunar close approach to Antares this month. An occultation will occur over the western Pacific.

The Harvest Moon is the full moon that occurs closest to the Autumnal equinox each year. This full moon was known by early Native American tribes as the Corn Moon and the Harvest Moon. Other Native American names are Autumn Moon, Rutting Moon and Mating Moon (Cree), Child Moon (Tlingit), Falling Leaves Moon (Ojibwe), Leaves Turning Moon (Anishinaabe), Moon of Brown Leaves (Lakota), Moon When the Rice is Laid Up to Dry (Dakota) and Yellow Leaf Moon (Assiniboine). In French - Pleine Lune de Septembre, in German - Vollmond im September, in Spanish - Luna llena de Septiembre and in Greek - πανσέληνος Σεπτεμβρίου i.e Pansélinos Septembríou

I have found no constellation with as much written imagery as Lyra. From Sappho and Pindar at some 500 or 600 BC up through Shakespeare, the Lyre was honored as magical and as the precursor of the stringed instrument, from the original tortoise shell with seven strings representing the Pleiades to our modern-day Welsh and Irish Harps.

The Greeks seem to have confused the stories behind the harp, however, we may also be accused of telescoping history or maybe more literately historical myth.

As it begins, the Lyre was invented by Hermes who gave it to his half-brother Apollo. From there, the most famous of those associated with the Lyre is Orpheus, son of a Muse and a prince, or maybe Apollo. Orpheus was gifted with the talent of music.

> "*Everything that heard him play,*
> *Even the billows of the sea,*
> *Hung their heads, and then lay by…*" Shakespeare

Orpheus married Eurydice, who depending on the legend, was frolicking with her maids at her wedding or running from a man who wished to do her harm; she stepped on or was bitten by a viper and died. She went to Hades. So, when Orpheus determined to have his wife released from Hades, he:

> *"E'en to the dark dominions of the night*
> *He took his way, through forests void of light,*
> *And dared amid the trembling ghosts to sing.*
> *And stood before the inexorable king.*
> *The infernal troops like passing shadows glide,*
> *And listening, crowd the sweet musician's side;*
> *Men, matrons, children, and the unmarried maid,*
> *The mighty hero's more majestic shade,*
> *And youth, on funeral piles before their parents laid.*
> *E'en from the depths of hell the damn'd advance;*
> *The infernal mansions, nodding, seem to dance;*
> *The gaping three-mouth'd dog forgets to snarl;*
> *The furies hearken, and their snakes uncurl;*
> *Ixion, seems no more his pain to feel,*
> *But leans attentive on his standing wheel.*
> *All dangers past, at length the lonely bride*
> *In safety goes, with her melodious guide."* - Virgil
>
> Alas, he was only human - he erred, and he failed.

As it aged, the Arabs called Lyra "the Swooping Eagle," to distinguish it from Aquila, which was regarded as "the Flying Eagle. The Persians also called it Harp, but later, as national boundaries solidified, we find that the Bohemians called it "The Fiddle", Teutons Harapha, and the Anglo-Saxons Hearpe. Britons named it "Arthur's Harp", the Egyptians Vulture, then came the Christians.

Also, Lyra is the "Stone Eagle of the Desert," which shows the bird with half-closed wings versus the outspread wings of Cygnus and the aforementioned Aquila.

The lyre had multicolored identities to go with its multicultural legacy. It was a Ram, a Mule, a tripod, a bowl and a scroll. Many cultures considered it Avian. Most commonly an Eagle or a Vulture as is shown on some globes. The bird reference is even found in Australia where to the aboriginal, Lyra was called Neilloan and represented a ground dwelling bird. Lyra was known as Urcuchillay by the Incas and was worshiped as an animal deity.

Returning to the invention of the Lyre by Hermes, the story tells of him finding a dried tortoise shell on the shore of the sea, with its tendons stretched across. This allusion stayed with the Greeks and Arabs who referred to the constellation as Testudo; in Spanish Galapago orTesta. The symbiosis of the Greek and the Arab is seldom seen better than in the constellation of the Lyre.

An alternate tale records Amphion, a son of Zeus and Antiope, who built the walls of Thebes with the help of his twin brother Zethus. To move the heavy stone, he started singing and playing the Lyre. The stones began to follow him, transported by his voice and the music of the Lyre.

Four and five thousand years ago in the Euphrates valley, a goat and a dog were placed in the sky where Lyra and Hercules are now. These were almost certainly identified as special to the goddess Gula.

In its history, this asterism has been almost universally described as a bird or a musical instrument.

"For Orpheus' lute was strung with poet's sinews;
Whose golden touch could soften steel and stone,
Made tigers tame, and huge leviathans
Forsake unsounded deeps to dance on sands."
The Two Gentleman of Verona - William Shakespeare

"I saw with its celestial keys,
Its chords of air, its frets of fire,
The Samian's great iEolian lyre
Rising through all its sevenfold bars
From earth into the fixed stars"
The Occultation of Orion - Longfellow

Mercurii philosophici firmamentum firmianum
Corbinian Thomas

The Chinese also have a rich relationship with Lyra. She has lovers, working girls, a bureau of standards and, as I drew on the chart, Niandao, a route the emperor chose while moving between palaces. (Star chart from *Ian Ridpath*)

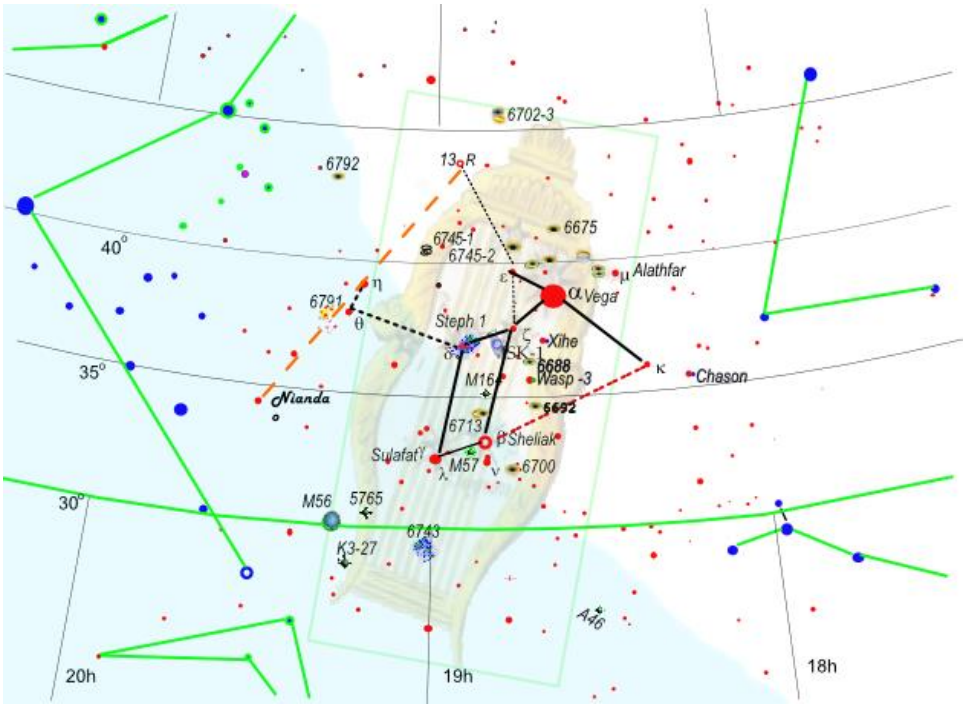

Simon Dawes -on flickr

As it is rich in poetry, so is Lyra rich in astronomy. There are, for the amateur, over a hundred variable and multiple star systems. Lyra is rich in galaxies, planetaries, open star clusters, extraterrestrial planets, a corner of the milky way and a globular cluster.

Of all these riches, however, the most looked at is M57, the Ring. Plenty has been written about it. How crisply can you resolve it? Have you seen the central star? How about the outer shell? Then there is the region around the ring.

Scott Houston wondered if you can find NGC's 6700 and 6713, two 13th magnitude galaxies near. He also wrote of IC 1296 and if anyone had ever seen it visually. It's a 15th magnitude barred spiral in the same wide field view of your eyepiece.

Equally as difficult will be NGC 6745a&b. A pair, or triplet perhaps, of interacting galaxies with a distinctive bird's head shape. It's small though, good luck.

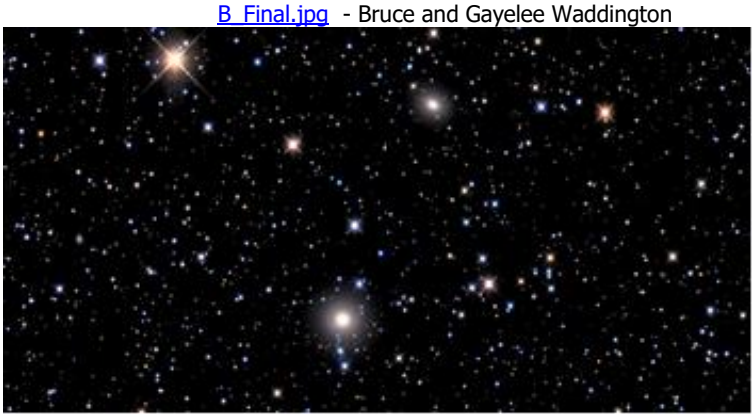


Up near the top of Lyra are NGC's 6702 and 6703. Elliptical and Lenticular, they look somewhat alike. N6703 is about a mag. brighter than its cousin at 11th. The eastern side of Lyra is also a hunting ground for NGC's 6688 and 6692, interesting galaxies in their own right. I am equally interested in large, sparse open clusters around Lyra. Steph 1, as opposed to Steph 2 in Scutum, is superimposed over delta δ Lyrae, a multiple star.

I have little information about Dr. Sofik Iskudarian, except that she was an astronomer at Byurakan Astrophysical Observatory in Armenia. She also has an open star cluster Isk 1, named after her near zeta, ζ. Its claim to fame is that it's 110' in size. From the obscure to the sublime is N6791 over by theta, θ. 6791 is 10th magnitude and rather rich and a fairly good size. Two more open clusters are ASCC101 and N6743, though somewhat sparse as are most OC's. Both clusters will be visible in your finder.

www.coldphotons.com/zen_astro/astro_images/M57_HaLRGB_Final.jpg - Bruce and Gayelee Waddington

NGC6745a&b www.astrobin.com/full/yfu2o9/0/



NGC6702 and NGC6703

Lyra also has interesting individual stars and planets. Vega is a close double, not related, but the contrast between 1st and 10th magnitude is difficult. Epsilon ε, is the double-double. R lyrae and T lyrae are variable stars. T is a carbon star and very red. Beta β, named Sheliak, is one of the brighter stars in Lyra. It is a six-star system. How many can you see?

Named stars with planets are Wasp 3 with one planet, Kepler 37 with 3 planets, and K102 which is interesting. It has 5? planets and two red dwarf companions. Can you imagine the sights you'd see standing on one of those planets? K138 is a 13th magnitude red dwarf with three or four planets and HD 173416 is named Xihe. Xihe, a sun goddess, is 6th magnitude and has one planet. Others are Hat-P-5, named Chason. Gliese 758 is a close 6th magnitude star with a "brown dwarf" companion. Gliese 747 is very red and 11th magnitude.

Historically named stars in Lyra are Vega α, relating to the swooping of an eagle. In modern Spain a vega is a large pasture or field. Aladfar η is a talon of that swooping eagle and Sulafat γ returns us to the shell of a tortoise.

M56

https://ocastronomers.org/wp-content/uploads/2018/12/M56-OCA.jpg

We need not forget Lyra's lone globular, M56. You will need some glass to see it well. It is 9' across, but at 8th magnitude and quite loose and sparse, an "X", per Shapley-Sawyer, it will be a tough find in binoculars from your back yard.

There are a couple of planetary nebulae in Lyra bright enough for us to see, though none brighter than 13th magnitude. Close to M57, halfway to Vega is 13th magnitude Minkowski 1-64, a small cousin to its brighter neighbor. Then look for N6765, 13th magnitude and half a minute in size. The images show it to have an irregular shape. Kohoutek 3-27 is 15th magnitude and Abell 46 is 13th. Images of these objects can be found on Astrobin.

Dark Skys

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