SIRIUS ASTRONOMER

www.ocastronomers.org

The Newsletter of the Orange County Astronomers

July 2022 Free to members, subscriptions $12 for 12 issues **Volume 49, Number 7**

This is the Cave nebula, also known as Caldwall 9 and Sharpless 2-155, and imaged through narrow band filters. It is an emission nebula in Cepheus, about 2400 light-years away; part of an HII region within a larger complex containing emission, reflecting and dark nebulae.
Captured by Jerry Floyd using ZWO ASI1600 monochrome camera through a William Optics FLT-132 refractor. It was done at the OCA Anza site, September 25, 2020

Because of the COVID-19 crisis and ongoing efforts to reduce exposure to the virus:
* **Some in-person club events are cancelled**

Please read more about how OC Astronomers has modified its activities on page 3.

Upcoming Events - free and open to the public

Beginner's class	Friday, 5 August at 7:30 to 9:30 PM ONLINE This is session 6 of the class. This session is "How to Use Your Telescope". It covers the basics of astrophotography, types of imaging, how different types of cameras are used, other equipment involved and considerations for taking a good picture. Taught by Kyle Coker. Class materials can be downloaded from OCA website.
Club Meeting	Friday, 8 July at 7:30 to 9:30 PM ONLINE "What's Up?": Dr. John Garrett from TVA Main speaker: Dr. Larry Crumpler from Volcanology and Space Sciences at the New Mexico Museum of Natural History and Science and the talk will be "Rovers on Mars: 21st Century Natural History Expeditions to Another Planet "
Open Spiral Bar	Saturday, 9 July 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.

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

President's Message

By Barbara Toy

Now that we've passed the longest day of the year and official start of summer, we can expect hot days and fairly warm nights for July and August. Hopefully we'll also have clear nights in July and August, but some years don't work out that way. Sometimes "June Gloom" seems to last well beyond June, and sometimes it's the summer monsoon thunderstorms that get in our way.

We didn't have much monsoon weather last summer but could see more this year. From Orange County, we see that mostly as big thunderheads building up behind the mountains, usually in the afternoons. Out by Anza, the monsoon season can mean thunderstorms during the day, and sometimes into the night hours. Often the sky will clear up from afternoon storms soon after sunset, but when they don't the cloud cover can be pretty thick and, even if there are clear spots (aka "sucker holes") to chase for some level of viewing, it pays to keep an eye out for rain in the vicinity – it's far better to get your equipment under cover ahead of a storm than to have to dry it out later. I recall some nights when it was reasonably clear at our site but there were nice lightening shows going on at the horizon – sort of a viewing extra, fun unless it turns into rain.

Some years the monsoon storms have been intense enough to cause flash flooding in some areas and damage to the roads that get us to our site and on the site itself – as you know if you've ever been caught in one of those downpours, they can be pretty intense, which translates to a lot of run-off. The dirt roads don't stand up well to those conditions, but our various neighbors along the main road in have generally been good about keeping them in better condition than I recall from the early years when I was going out there. However, repairs don't happen instantly, and if you're planning to go out to Anza and there's been monsoon activity, it's a good idea to check on our email groups for information other members may have about conditions out there, particularly as to the roads.

Reminder – Our First Post-Covid Shut-Down Starbecue is July 30, 2022!

Well, our first formal star party after the two-year Covid-induced hiatus was supposed to be Memorial Day weekend, but we got clouded out – all the forecasts on the different weather programs were pretty gloomy about the prospects and it turned out they were right. With rising gas prices and all, it didn't make sense for most people to go out there to admire the bottoms of clouds, so it wasn't much of a surprise to find that the only people who were there when we got there were some of the observatory folks. We wound up not staying, and the all-sky camera on our website showed that we and everyone who decided not to go out there for the star party made the right decision.

It would be a pity if the first real star party we had this summer was the July party and Starbecue. I'm hoping that the June party will have clear skies and give us a taste of what we've been missing for the last two years, stary-party-wise.

The Starbecue remains on calendar for the July 30, 2022 star party – which, as you may remember, is the closest Saturday to New Moon in July – I think I mistakenly gave the date as July 28 last month, which is the actual date of the new moon but is a week night and many of us have to work. My apologies for the mistake – it's definitely the following Saturday, July 30, which is a couple days after New Moon, so there'll be a crescent moon to admire in the early evening hours, and the rest of the night should be quite dark.

So, please plan to come out for the Starbecue on the evening of the July star party, bring something to eat and to share, and plan to enjoy the company of fellow club members along with good eats and – we hope – a night of good viewing and imaging! The Starbecue will be starting around 5:00 p.m. at the club observatory – I hope to see you there!

Other Updates…

We still don't know when Chapman University will allow us to use the auditorium again for our general meetings. It seems unlikely that it will be before September, but we haven't received confirmation of any date yet. So, please stay tuned, and hopefully we'll be seeing everyone in person there before too much longer. As I've said before, though, we still plan to keep the remote option as well, for those members who aren't able to make it to in-person meetings. As another aspect of the remote meetings that we don't want to give up – we expect that we will be having at least some of our speakers attending remotely, as that gives us access to a much broader range of speakers and has been a very successful aspect of our virtual meetings for the last two years.

There's still uncertainty about when the Orange County star parties will be restarting, and we'll post information on the website when we learn about it.

The Astrophysics SIG has resumed its regular meetings at the Heritage Museum, and they seem to be going well. Those are on the third Fridays of each month, if you are interested in attending.

The AstroImage SIG does not yet have plans for restarting in-person meetings, and I've been told that the location where they were meeting is no longer available. There is a lot of activity on the AstroImage email group, though, and, if you are interested in astroimaging, I recommend you join it if you aren't already on it. I think that would be your best source of information on any plans for in-person meetings, as well.

Our Outreach Program has generally not been as active during the summers, as most of our outreaches have been with different schools, but sometimes there are viewing events scheduled at local parks – if you're interested in volunteering to assist at those kinds of activities, please let Ceci Caballero know. September isn't that far off, and that's when our more intense season of outreach activities begins. We'll need more volunteers to help out, as it seems that there are a lot of schools who have suffered severely from astronomy-deprivation over the last two years, and they all want to schedule events.

Sharing what's up there with students and their families is really satisfying and leaves a happy glow that lasts long after the events are over. If you haven't tried it, please check the calendar periodically for events near you and let Ceci know you'd like to volunteer for any that are close – after you've done a couple and get the feel for them don't be surprised if you find that you really do want to do more. It's a volunteer program, so you don't have to do any that you don't want to do, but outreach is one of our most important programs – we're an educational non-profit – as it helps show members of the public that science can be fun and accessible, so any contribution you can make as an outreach volunteer is particularly important to the club and its educational goals.

Whatever your astronomical activities may be in the coming months, I hope they go well, and that all or you and your loved ones stay healthy!

© Barbara Toy, June 2022

Response to COVID-19 Crisis

Any use of the club's Anza site by members is at their own risk. Visitors should bring supplies to clean and sanitize surfaces they contact. When you leave, take any trash that you generate or find on site out with you. Please maintain social distancing if anyone else is out there.

Meeting in person:	Astrophysics SIG
Meeting via Zoom:	Monthly club meeting, Beginner's Astronomy class
Cancelled until further notice:	Orange County Star Parties, AstroImaging SIG, in-person club general meetings
Check with Coordinator:	Outreach events

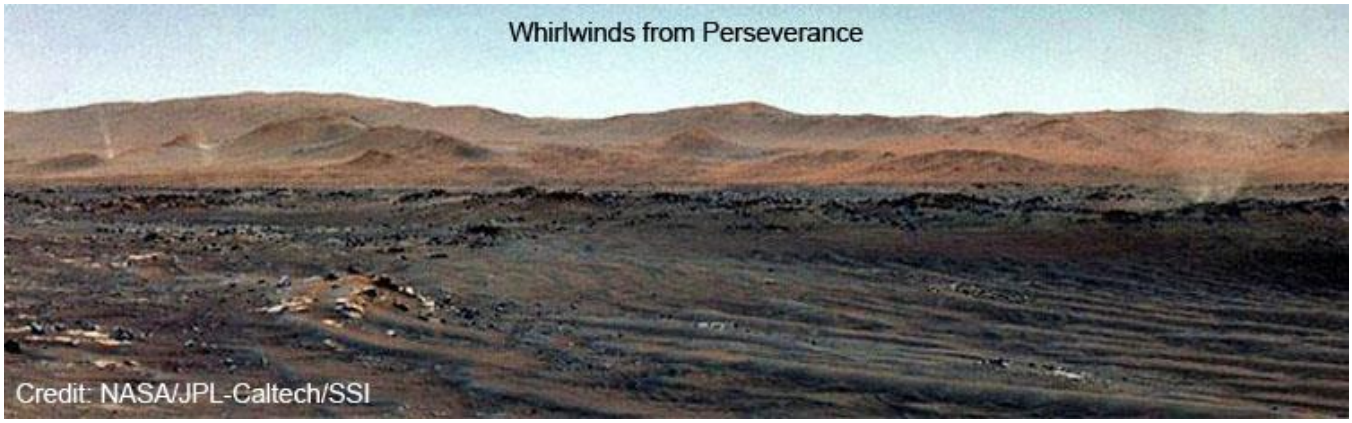
AstroSpace Update

July 2022

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

JWST Survives Micrometeoroid – The James Webb Space Telescope (JWST) team revealed that one segment of its main mirror has been hit by a micrometeoroid that caused a very slight degradation in its image. The impacting object was roughly the size of a dust particle, but still a bit larger than pre-launch estimates predicted should hit the mirror during the lifetime of the telescope. The quality of the image still exceeds the original design requirements. The impactor was not a part of any meteor shower.

Neptune Blues Explained – Uranus and Neptune have very similar conditions, including atmospheric composition, and yet they are not the same color. Uranus is more greenish and Neptune more bluish. A new study, using ultraviolet, visible light, and near-infrared, has explained the difference. Both planets have 3 layers of haze in their atmospheres. In the middle of the 3, methane ice condenses on the haze particles, which tends to give the more greenish color. But Neptune has a faster moving atmosphere, which dissipates the methane ice, and keeps the color more bluish. The methane gas in both planets' atmospheres gives the blue color when viewed in sunlight.



Martian Dust – Mars rover Perseverance has observed some of the most intense dust activity since its landing, including typically 4 daily whirlwinds and occasional gusts lifting huge dust clouds. Jezero Crater, where Perseverance is exploring, might be a major source of atmospheric dust. Meanwhile Insight, the lander about 2000 miles away from Perseverance, is having its solar panels obscured by dust, with never a whirlwind to blow the dust off. Ironically Perseverance is nuclear powered and has no solar panels that would profit from all the whirlwinds it is getting. Instead, the dust activity has damaged wires on Perseverance's weather instruments. Spacecraft controllers are attempting to develop new weather software that doesn't use the damaged wires.

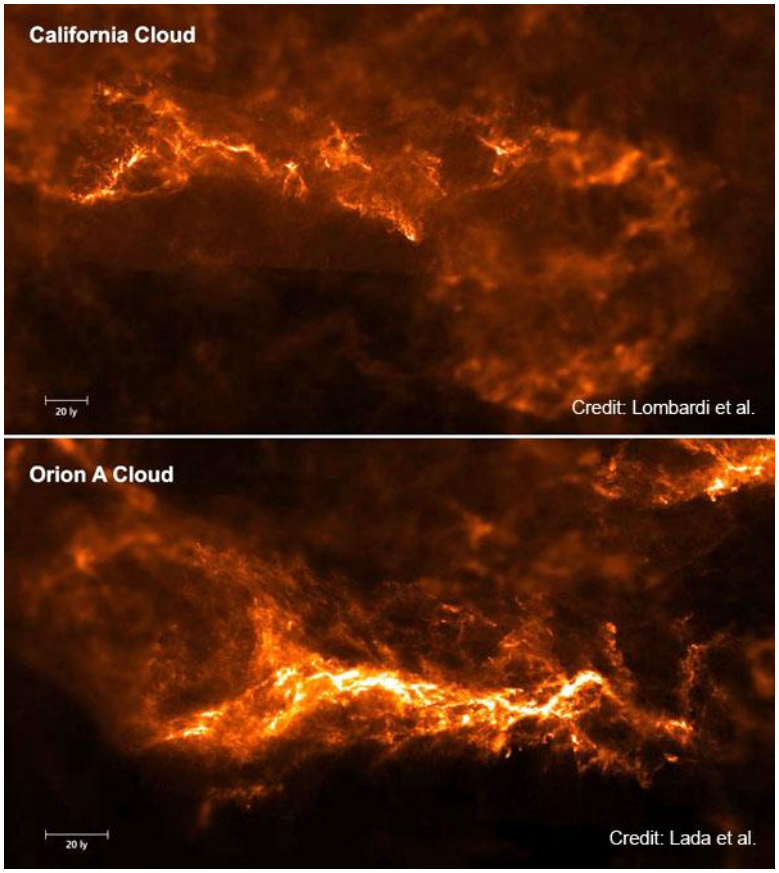
Ingenuity – During tests of the Mars helicopter Ingenuity, it was found that its inclinometer has stopped functioning. This is used only to determine which way is straight up compared to the tilt of the ground it is sitting on, just before take-offs. However, controllers believe that this tilt can be calculated from Ingenuity's accelerometers, so new software is being sent to the helicopter that doesn't use the inclinometer.

Asteroid Amino Acids – Examination of the sample brought back from asteroid Ryugu by spacecraft Hayabusa2 shows that it contains more than 20 amino acids. These are the building blocks of life. This supports that some building blocks of life may have been created in space and brought to the early Earth by asteroid impacts.

Brown Dwarfs Found – Only about 40 brown dwarfs orbiting stars have been directly imaged. This is because it is very difficult to image such a dim object so close to a far brighter star. Brown dwarfs are stars with so little mass that they cannot sustain the fusion of hydrogen that powers ordinary stars. A new search method has imaged 4 more brown dwarfs. This approach is to look only at stars that show some evidence of an orbiting body, such as gravitationally induced wobble. This is similar to the radial velocity method of finding exoplanets. The new study selected 25 stars that showed influence and were able to image the 4 new brown dwarfs.

Variable Stars Found – Over the centuries, astronomers have found 46,000 stars in our Milky Way that vary in brightness, and a smaller number of them outside our galaxy. A team of citizen scientists, a computer program taught how to recognize variable stars, data from the Gaia spacecraft and 2 infrared surveys, and a network of ground-based telescopes performing follow-up observations have discovered 116,000 more variable stars.

3D Nebula Maps – The Gaia spacecraft has measured distances to and other properties of more than a billion stars. Now when starlight shines through a gaseous nebula, astronomers have found they can calculate the distance to the nebula, not just to stars, with the Gaia data. Astronomers have applied this to make 3D maps of the Orion A and California nebulas. The Orion Nebula M42 is a part of Orion A. They found that Orion A is denser and more complex in structure than the California. The latter was found to have a rather flat structure. Differences in density probably explain why Orion A is, by far, exceeding the California in star formation. The astronomers plan to use the same methods to make 3D maps of nebulas throughout the Milky Way.



Exoplanets in Gaia Data – Scientists trained a computer program to search the Gaia data for exoplanets, and so far it has found 2 of them. Both are hot Jupiters, that is, gas giants that orbit quite close to their stars. The planets were confirmed with data from TESS, a planet-finding space telescope. This search has also turned up 41 more suspected planets, which still need confirmation.

Nearby Rocky Exoplanets – An international team of astronomers using the TESS planet-finding space telescope has found a pair of rocky planets orbiting the red dwarf star HD260655, only 33 light-years away. They are 1.2 and 1.5 times the diameter of Earth. The planets were confirmed with the radial velocity technique, which yielded their masses, showing they are rocky planets. They are prime candidates to have their atmospheres analyzed by the James Webb Space Telescope, because they are so close to us. They are not candidates on which to look for life, however, because they orbit so close to their star that the surface temperatures are likely several hundred degrees.

Dwarf Galaxy Black Holes – The radiation emitted by material falling into the black hole at the center of a dwarf galaxy looks too much like the radiation from high star formation. This confusion exists for dwarf galaxies, but not for full-size galaxies. Therefore, astronomers are quite sure that supermassive black holes exist at the centers of nearly every full-size galaxy, but they are uncertain whether this holds for dwarf galaxies. A team of scientists compared computer simulations of star-forming dwarf galaxies with central black holes to radio and ultraviolet observations of a large number of dwarf galaxies, and concluded that central black holes are common in dwarf galaxies.

Isolated Black Hole – Theoretically massive stars dying should have left 100 million black holes in the Milky Way. However, only those with close companion stars are likely to be discovered, as the material falling into the black hole from its companion creates X-rays. This explains why only a few dozen black holes are known within the Milky Way. A black hole without material falling in, isolated from any close companion, has now been found about 5000 light-years away. It was found with microlensing, where a foreground massive object passes in front of a more distant star and gravitationally lenses and magnifies it. About 30,000 microlensing events have been seen by surveys watching for them, and one such event was caused by an object so massive that it likely is a black hole. A second team that analyzed the event was not as sure of the mass and claimed it might be a neutron star rather than a black hole, though no other evidence of a neutron star there has been found.

Slowly Rotating Neutron Star – An international team of scientists has discovered a neutron star rotating extremely slowly, taking 76 seconds for each turn. It was seen by the MeerKAT radiotelescope in South Africa. The radio signal is seen for only 0.5% of the rotation period, so any similar objects would be difficult to detect. Substructure within the radio pulse suggests it is a pulsar, but polarization of the pulses suggests it is a magnetar, both being types of neutron stars. Astronomers have theorized there should be long period magnetars, and this may be the first found. White dwarf stars have such long rotation periods, but observations of the new discovery at wavelengths other than radio do not look like a white dwarf.

Young Bright Pulsar – Astronomers using the Jansky Very Large Array radiotelescope found an object that appeared somewhere between images taken in 1998 and 2018. The observations best fit the characteristics of a pulsar, that is, a rotating neutron star. It could possibly be the youngest pulsar known. A pulsar is born when a star in a certain mass range explodes as a supernova. Typically, this involves so much debris that the pulsar is not seen for years until much of the debris dissipates. So the date of this pulsar birth cannot be well determined. The newly seen object has been dubbed VT 1137-0337 and lies in a dwarf galaxy 395 million light-years away. The radio signal is similar to that of the famous Crab Nebula pulsar but is about 10,000 times as intrinsically bright.

Unusual Nova – The fastest nova ever seen was discovered by an amateur astronomer and observed extensively by professional astronomers. A nova occurs when hydrogen is gravitationally pulled from a close companion star and then accreted onto a white dwarf star. At a certain point the hydrogen undergoes a nuclear explosion, which astronomers see as a flash of light that typically last weeks or months. This one lasted one day. The Large Binocular Telescope in Arizona is still able to see the dim remnant and continues observations to try to discern why this nova was so quick. The nova is also unusual in that it pulses every 501 seconds, which has continued before, during and after the nova explosion.

Reionization Time Measured – Sometime after the Big Bang, the Universe cooled enough for protons and electrons to combine into neutral hydrogen gas. When enough stars formed to light up the neutral hydrogen with ultraviolet light, essentially all hydrogen between galaxies got ionized, that is, the electrons were stripped off. This event is called the reionization of the Universe. How long reionization took has long been hotly debated. A group of astronomers measured when ionized hydrogen replaced neutral hydrogen, the starting point of reionization, in what they believe is the most precise such measurement thus far and put that time at 1.1 billion years after the Big Bang. This is somewhat later than previous measurements and theory. When reionization occurred can tell scientists what type of stars and galaxies were prevalent, and therefore were the cause of reionization. The new measurement was made by examining the spectral lines imprinted by hydrogen gas clouds on the light from 67 distant quasars that shined through those clouds. The redshift of those lines tells astronomers when the light passed through those clouds. Some of the cosmic web consists of neutral hydrogen, so the astronomers had to disentangle cosmic web spectral lines from those they were measuring.

Growing In Lunar Soil – Researchers have for the first time grown plants in lunar soil. The plants were thale cress. The researchers used less than an ounce of lunar soil brought back by 3 Apollo missions and added a nutrient solution and supplied light and water. The plants adjusted their root structure, more kinked and distorted, to tolerate the different soil.


Credit: Tyler Jones, UF/IFAS

MAVEN Recovers – Back in February, MAVEN, the spacecraft studying Mars' atmosphere, had a problem with both of its Inertial Measurement Units (IMUs). This sent the spacecraft into safe mode, where it stops science operations and awaits commands from Earth. MAVEN controllers developed a navigation method that tracks stars instead of using the IMUs, and so were able to bring MAVEN back into full operation late in May. The spacecraft team had been working on developing star-tracking navigation since the first of the 2 redundant IMUs had started acting up some time ago. But the team completed installing the new navigation 5 months ahead of schedule to address the safe mode. Functioning of MAVEN is important not only for its atmospheric science, but also because it is a principal means of relaying data from many of the craft on the surface of Mars back to Earth.

Voyager 1, which flew by Jupiter and Saturn in 1979-80, and has been collecting data on interstellar space for nearly a decade, has encountered a problem that jumbles data regarding its attitude in space. The problem does not affect the science data that it sends to Earth. Spacecraft controllers are trying to troubleshoot the problem and see if it can be fixed with software changes or use of redundant hardware.

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 rongrace2@cox.net
- Orion StarShoot AutoGuider further reduced price $ 200

For Sale contact Rick Hull hull3hull3@yahoo.com 949-636-2920 cell
- QSI 6120C OSC CCD camera with Mechanical Shutter reduced price $ 1800 +sh

This unit was built before the ATIK acquisition, so you know it was built to QSI quality standards.
Camera body is the "-s" version with mechanical shutter. The front end can be replaced to have an integrated OAG and/or filter wheel. Unlike more economical cameras using only desiccant, QSI 6xx series have a sealed chamber, purged and filled with a noble gas.

Built around the Sony ICX834 with EXview HAD CCD II technology, this 12M sensor is perhaps the best CCD by Sony before ending CCD production - high in sensitivity, low in noise. Pixels are 3.1um for high resolution and image array is 8.8x13.2mm in size. The 3.1um pixels are nearly ideal for those using focal lengths of 600 - 1200mm desiring to achieve maximum resolution, as seeing permits. I believe the Bayer mask is superior to most found on CMOS sensors which are designed for consumer cameras, providing less overlap of the color channel band-passes. I can provide a few images taken at 770mm focal length out at Anza. Contact me by email.

New, this camera is now $4200, and the ATIK 4120C which is a basic lower-end cousin, is $3K.
On CN I am asking $1900, any OCA member may purchase it for $1800 plus shipping.
Please feel free to contact me with any questions.

For Sale contact Rick Hull hull3hull3@yahoo.com 949-636-2920 cell
- SBIG ST-i Mono; Guide/Planetary camera with mechanical shutter reduced price $ 280

Price includes shipping and PP fees

For Sale contact Jerry Floyd jlfloyd720@gmail.com
- Denkmeier Binoviewer II $ 999 or make offer

Complete with SCD holders, Power X Switch, Newtonian spacer tube, 2" nosepiece, 2" Multipurpose OCS cell, 2x14mm Denkmeier eyepieces, but does NOT have 1.25" nosepiece.

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
- Bushnell Red Dot Finder 1X30RD with mounting rail, Green & RED variable intensity LED. $ 30
  1:1 magnification, end caps, precision, like new
- Bushnell type Red Dot Finder made by Comunite 1X30RD with mounting rail. Almost exactly like the Bushnell, Green & Red variable intensity LED. 1:1 magnification, end caps, precision, like new. $ 20

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

For Sale contact Michael Newman mnewman2112@gmail.com

- Pad lease for LP-12 in Lower Pads section and the pier upon it $1250

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 Jim Benet jimbenet@pacbell.net 714-693-1639
$2500.00 Lot

- Telescope: Celestron C11; 11-inch SCT; 2800mm fl
- Tripod: Losmandy G11 aluminum tripod
- Mount: Losmandy with one 7# and two 11# counter weights; 1" diameter shaft; polar scope.
- Controller: Losmandy Gemini I with cables and hand controller
- Lenses 2": Televue 27mm Panoptic; Televue 16mm Nagler Type2; Televue 9mm Nagler; Meade 56mm Plossl; Vixen Er32mm
- Lenses 1.5": 3 each 25mm Plossls
- Reticles: Celestron 12.5mm; Orion 12.5mm; Meade 12 mm illuminated crosshair reticles
- Filters, 2": Orion 13% moon filter; Lumicon UHC (Gen 1); Lumicon Deep Sky Filter
- Filters, 1.25": 6 colored filters; moon filter
- Filter, solar: Thousand Oaks Optical 4.5" offset aperture
- Adapters: Meade Series 5000 2" 90° diagonal; Meade 1.25" 90° diagonal; 3 each 2-inch to 1.25-inch lens adapters; Canon type T-adapter
- View finders: 9x50mm Celestron finder scope; Telrad
- Dew shield: Astrozap aluminum dew shield
- GPS receiver: Star GPS receiver; GPS-NX01
- Cases: Footlocker with custom-fitted Styrofoam for optical tube; Pelican padded transport case for mount; lens case; accessory case for Telrad and viewfinder; counterweight container; case for cables, hand controller, GPS receiver; boxes for solar filter and dew shield
- Power: One 15V, 10amp regulated power supply; one 13V, 10 amp regulated power supply; Suaoki U10; 20Ah lithium-polymer battery; power supply cable; Astro Electric polar scope dimmer controller.

Note: Equipment is used. Some items show wear but everything is completely functional.

For Sale contact Jim Benet jimbenet@pacbell.net 714-693-1639
$1000.00

- Anza pad license for TP-05 pad on Ten Pad Alley at 33.48384°N, 116.72166°W.

Includes bench, pier with 4 electrical outlets and Losmandy mount adapter. Excellent view of valley and Omega Centauri.

From the Editor

Sirius wants photograph submissions from club members
Sirius is running low on pictures. Please send pictures to me along with a brief description of the subject, where the image was taken, and the equipment used.

Ideas for Future articles
The newsletter includes articles from members or about subjects suggested by our members. We seek ideas and writers to cover them. To contribute an article or work with the editor to produce one, please contact me at newsletter@ocastronomers.org .

Due dates for submission of articles, pictures and advertisements

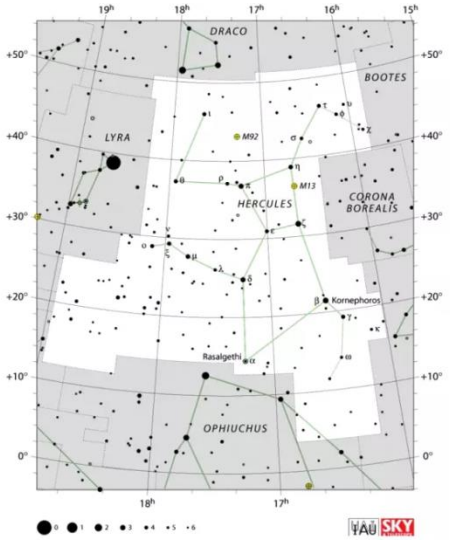
Issue	Due date
August	23 July
September	20 August
October	18 September

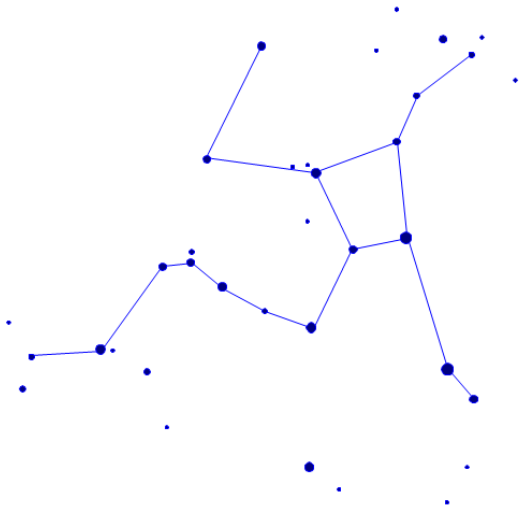
Another Look

Dave Phelps, July 2022

Buck Moon - Some refer to this moon as the Thunder moon, due to the summer storms in this month. Other names include the Hay moon, after the July hay harvest. Some Native American tribes call it Salmon Moon and Raspberry Moon. In Celtic, this Moon was known as the Claiming Moon, Wyrt Moon, Herb Moon, and Mead Moon.

New Moon – July 28, 0955 PDT; Full Moon – July 13, 1038 PDT





I once searched for Abell 2151, the Hercules Cluster. It is way off in a corner of Hercules almost in Serpens Caput. I remember it well. It was one of those objects that I could move the Horse to, look through the Telrad and have it in the eyepiece. I nicknamed it the String of Pearls because NGC 6040 and NGC 6041 formed a curving line with NGC 6039 and other fainter galaxies. I was mesmerized. I remember counting nearly a dozen galaxies around NGC's 6040-41 and I have read that there are over 200 galaxies in the field. Uranometria shows around 20 galaxies visible to any telescope that can reach 4th and 15th magnitude, more to add to the bucket list. The Cluster is part of the larger Hercules Super-cluster and the even bigger Hercules-Corona Great Wall, none of which I have ever studied. Maybe that's a good thing. It seems the experts are disputing whether the H-C Great Wall belongs with the other recognized GW's, though; at least one reference describes it as the largest structure in the universe. ***Hercules Constellation: Stars, Myth, Facts, Location... Constellation Guide (constellation-guide.com)***

Not too far away from Abell 2151 is the Turtle Nebula, NGC 6210, an amorphous planetary a little brighter than 9th magnitude and not too far from Beta β Herculis. Beta's name is Kornephoros and is at the shoulder of Hercules and down from the keystone. Kornephoros is the brightest star in Hercules, a few tenths brighter than Rasalgethi, Alpha α Herculi and a decent triple star system that is tough to resolve.

M92, NGC 6341and M13, NGC 6205 are closely matched cousins, though M13 gets all the print. They differ in magnitude by only a half, 6.3 and 5.8 and are almost the same classification, IV vs V. M92 is in the upper regions of the constellation between Hercules' legs, you will see a very sharp nucleus, while, well, you know how to find M13. Point your finder a third of the way down the right side of the keystone and there is the best globular in the north.

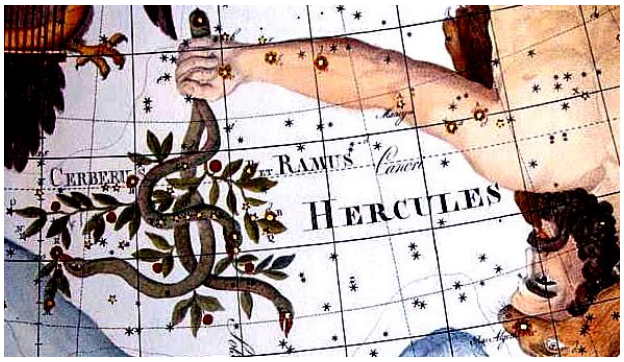
Up closer to the top of Hercules (actually his feet) is NGC 6229 a 9th magnitude globular that is apparently quite old and quite rich in metals. Its density class is not listed though its metallicity bimodality is designated as **GC(v)B** in the galaxy morphological classification. This is not something I am competent to discuss. If you know, send an email to the editor or the chain and let us all know.

Very close to M92, about a degree north-east is a small group of 14th magnitude galaxies, the NGC 6329 group. I remember seeing four galaxies with not much detail. If you have a big enough mirror and an eyepiece that gives you a degree field of view, you can add them to your life list.

The figure of Hercules as a kneeling man goes back thousands of years. The Babylonians associated the asterism with their own legendary heroes, Gilgamesh, Nimrod and their sun-god Isdubar. Phoenicians identified it as the sea-god Melkarth and the Greeks from as early as 450 BC minted coins representing their demi-god Heraklee. Alexander the Great believed he was a direct descendant. In fact, it is written that old Alex seemed to think he was his reincarnation. Funnily enough, while Hercules is the offspring of Zeus and the mortal Alceme, his name translates roughly as "glory of Hera". Bet that ticked her off.

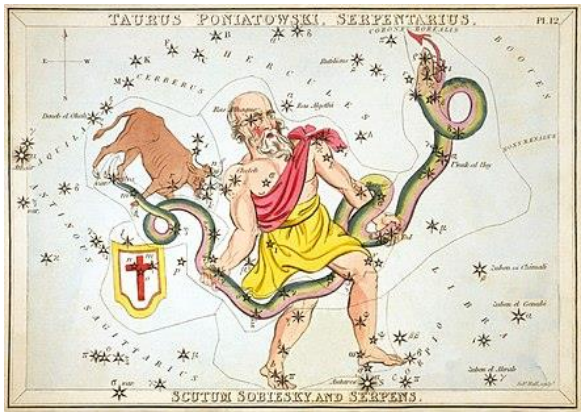
The famous keystone of Hercules is one of the most recognizable shapes in the spring, summer, and autumn skies and usually one of the first things I look for along with Lyra and Cygnus. Hercules has dozens of variable, double and multiple stars and star systems. One of the finest is Alpha α, a large orange giant with a companion of "emerald green". *(Mary Proctor, "Evenings with the Stars")* *"Evenings with the stars",: Proctor, Mary: Amazon.com: Books*

Alpha is an interesting star. As its magnitude varies from 3rd magnitude to 4th magnitude, it pulsates, ie: its size varies also. For now, imagine it from the center of the solar system to the orbit of mars, but even more, it has an envelope that extends almost 1000 AU. Alpha's temperature averages 2500 degrees Kelvin. Its density must be about the same as a hard vacuum. I wonder how far we could travel inside that star in our 100th generation starliner. (Do you remember a "Mote in God's Eye"?) ***https://en.wikipedia.org/wiki/Ramus_Pomifer#/media/File:Bode_cerberus.jpg***



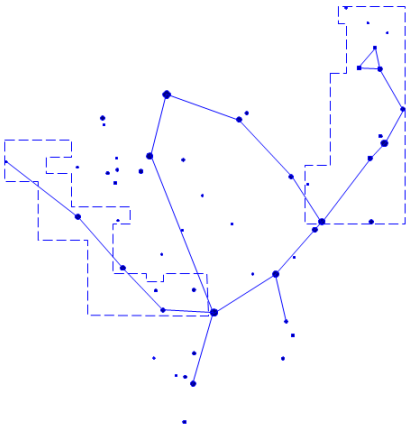
"Cerberus et Ramus".

Ramus Pomifer*, Latin for apple branch, was a constellation between* Hercules *and* Lyra*. It was depicted in the form of a branch held in Hercules' left hand. The also obsolete constellation of* Cerberus *made up of much the same stars - became combined with it in later depictions, with the name*



Serpens Serpens held by Ophiuchus, as depicted in Urania's Mirror*, a set of constellation cards published in* London *c. 1825. Above the tail of the serpent is the now-obsolete constellation* Taurus Poniatovii *while below it is* Scutum. **https://en.wikipedia.org/wiki/Serpen**

Ophiuchus is the odd shaped hexagon south of Hercules that holds some of the more interesting objects in the sky along with his brother constellations Serpens Cauda and Serpens Caput. The area has represented snakes or serpents or even maybe dragons since Babylonian time. The Greeks, though, put a pin in it. Generally, Ophiuchus represents Aesculapius, (many variable spellings), mythologically a son of Apollo who learned how to bring back someone from the dead. Serpens is the snake that showed Aesculapius how to do it by bringing another snake to life by dropping herbs on it. The story I remember from my Bullfinch's is that Aesculapius was raised by the Centaur Chiron, for whom, apparently, we have the constellation of the centaur. It was Chiron who taught him the art of healing. It is said that Zeus killed him with a thunderbolt because he was afraid that he would make all men immortal.

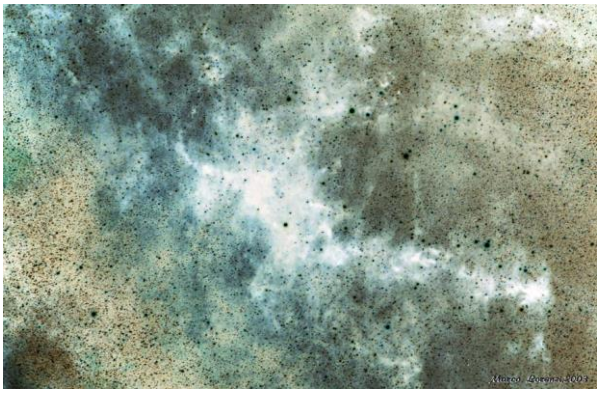


The name of the large constellation Ophiuchus means "serpent-bearer" in Greek. The ancient astronomer Ptolemy included *Ophiuchus* in his list of 48 constellations which he documented in the 2nd *century* (*Constellations except Zodiac, Northern and Southern - Vector stencils library)*. (It used to be referred to as *Serpentarius*, which is Latin and has the same meaning.) It is one of the 88 modern constellations.

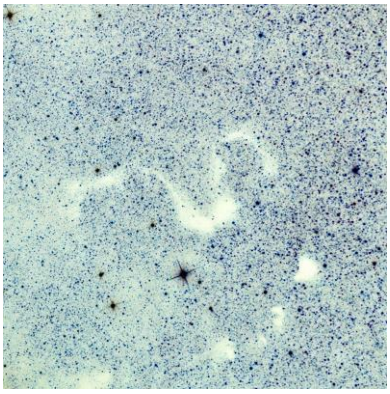
In Greek myth, *Ophiuchus* was said to depict the god Apollo wrestling the snake guarding the Oracle of Delphi. Although the myth changed many times over the years, it was always associated with a man wrestling a serpent.

Serpens has two Messier's M5 and M16. Ophiuchus has seven Messier's M9, M10, M12, M14, M19, M62 and M107. A happy hunting ground for you marathoners.

There are also two Palomar Globulars - Pal 15 (really tough at 14th magnitude) and Pal 6, possible at 11.5 magnitude. The Palomar Cluster catalog would be a challenge for any experienced amateur with some decent equipment. They are just difficult to see. I can remember the first time I saw Pal 6; it was small and dim and very exciting. It is located down not too far from the galactic center amid all that munge of star clouds, clusters and dark nebula. As you're looking south, it is just below the Pipe Nebula, the biggest(?) dark nebula in the sky and holder of several Barnard numbers, Barnard 59, 65–67, and 78. Just up from the Pipe is my favorite dark nebula, the Snake B72.



Pipe Nebula (astrosurf.com)



By en:user:Friendlystar - English Wikipedia, CC BY 3.0, https://commons.wikimedia.org/w/index.php?curid=4986855; https://en.wikipedia.org/wiki/Snake_Nebula#/media/File:Snake_Nebula.jpg

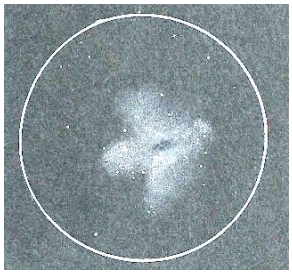
If you decide to search for Pal 15, you will need a strong star chart like Uranometria to do the search. You will find it near the center of Ophiuchus, near M10 and M12. I believe I only saw a glimpse of it back then. Hopefully when I can get some telescope time, I can search for it again. If you find yourself intrigued, there are two more Palomar's close – Pal 5 at 12th magnitude and Pal 7 at 11th. Pal 7 is down in the left hand corner by Nu v where Ophiuchus and S. Cauda meet. Pal 5 is tougher, it's up in S. Caput very close to M5. The Palomar cluster catalog can be found at http://www.deep-sky.co.uk/observing/palglobs/palglobs.htm. Good luck and Good Hunting.

As you know this region of the sky is among the richest. The Milky Way, nebula, clusters, Barnard's and constellations abound. So let me return to a suggestion I made months ago: get a decent planisphere and look at the sky. Like some of you, I was also guilty of tunnel vision. Focusing on some faint and fuzzy while staring at my setting circles. If you can't point out the six stars that make up the body of Ophiuchus and the four stars that make up the head of Serpens Caput, you could use a refresher course on using your eyes.

Let's slip over to the "Cauda" side of Ophiuchus next and find Barnard's star; it's only six light years away and has the largest proper motion recorded. It's a red 9th magnitude star. Its history is sorta cool - E.E. Barnard, a great double star hunter, noticed that his star had significant movement when he compared photo-plates twenty-two years apart back in 1916. Since then, he (she, shim?) has been immortalized in the literature of Douglas Adams, Arthur C. Clark and others.

You will find Barnard's star close to Beta Ophiuchi and surrounded by lots of fun stuff. NGC 6572 is a bright planetary nebula of 8th magnitude. Very near is IC 4665 a very open star cluster. Barnard's star is between IC 4665 and Mel 186. If you thought 4665 was spare wait till you try to identify Mel 186. There is just a ton of stuff in this area, enjoy you star hopping.

Between M16 and Barnard's star, Aquila, Scutum and Serpens Cauda, is one of the richest square degrees of sky we have, laying there along the edge of the Milky Way. Look in from our solar system in the Perseus arm of our galaxy to the Sagittarius arm, next arm in. Then slip your telescope down to the corner where Serpens meets Scutum, and there you have it: Open Cluster NGC 6611. If you put a nebular filter in your eyepiece you will pick up IC 4703, a strong star forming region. Burnham call this object the "Star Queen" nebula because he imagined a throne in the dark notch at the center of IC 4703. He had the virtue of using some big professional instruments in his career as well as access to Mt. Wilson and Palomar plates. Then came the Hubble. You won't see the pillars, they are the back of the Queen's throne, but you can imagine, and it would be pretty awesome to see what one of these new hybrid instruments could do. I've inserted an image that should give you an idea of what to look for in your backyard telescope.



https://www.cloudynights.com/uploads/monthly_06_2018/post-276706-0-67698400-1530396168.jpg sw

The Horse did a great job especially with a nebular filter but nothing like we see you astrophotographers doing today. I recommend that you go to the OCA web site and look at this image. It is very well done though not attributed. Emission nebula M16 (Eagle Nebula) in Serpens. - Orange County Astronomers (ocastronomers.org). While in the region, there is Barnard Dark Nebula galore within just a few degrees of the Eagle. Look for B92 and B93 close at hand, B312, up by the Swan, B103, Lynds 443, B97, B95 and B314 nearer to M11 and up there north of Scutum and into Aquila is B111, B119, Lynds 557, 564, 582 and 617.

Dark Skys

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