

IC443 the Jellyfish nebula from John Castillo taken on October 2008 at our Anza site using SBIG STL11000M C2 camera through Takehashi TOA-130f refractor

Because of the COVID-19 crisis and ongoing efforts to reduce exposure to the virus:

- **All in-person club events are cancelled**
- **Use of the Anza site is discouraged**

Please read more about how OC Astronomers has modified its activities on page 2.

Upcoming Events - free and open to the public

<p>Beginner's class</p>	<p>Friday, 5 June at 7:30 to 9:30 PM ONLINE The 4th session of the Beginners Astronomy Class covers the science behind the telescope. This month's topic is the physics behind perception of images.</p>
<p>Club Meeting</p>	<p>Friday, 12 June at 7:30 to 9:30 PM ONLINE "What's Up?": Chris Butler from OCA "Our Dusty Universe": Karin Sandstrom from University of California, San Diego - Center for Astrophysics & Space Sciences</p>
<p>Open Meeting</p>	<p>Sunday, 14 June at 10:30 AM to 12:00 PM ONLINE Come and socialize with your fellow astronomy enthusiasts face-to-face at this online meeting! See their latest Astro-photos and ask your questions from an astronomer. If you would like to make a short presentation with your Astro-photos or other astronomical activities, please contact the Vice President to be placed on the agenda.</p>

Please consult the calendar on the OCA website for link information needed to attend the meetings.

Response to COVID-19 Crisis

COVID-19 continues to affect all of our activities. All in-person club events remain cancelled through at least July. Cancellation periods for specific events are detailed below. Please see the President's Message for additional information.

Any use of the club's Anza site by members is at their own risk as we have no way of cleaning or sanitizing the site to CDC standards. If you must go to the site, be sure to clean and sanitize surfaces you have contact with and make sure it is cleaner when you leave than it was when you arrived. You must bring cleaning supplies and sanitizer with you as it is not provided at the site. Be sure to take any trash that you generate or find on the site out with you, and please maintain social distancing if anyone else is out there.

If you have any questions, feel free to contact board members or post them to the email groups or through social media. We will do our best to respond, but please bear with us if there is a delay as we all have other responsibilities as well.

We hope you and your families and friends all remain safe and healthy, and best wishes to all of you!

Summary of Cancellations of OCA In-Person Events

Due to the ongoing COVID-19 crisis, all in-person club events are cancelled through at least the following periods:

General Meetings	Cancelled at least through September; please try our virtual meetings instead
Anza Star Parties	Cancelled through July, to be reconsidered by the Board at the July meeting
Orange County Star Party	Cancelled indefinitely, until allowed by Orange County Parks
Outreaches	Cancelled indefinitely
Beginners Astronomy class	Cancelled indefinitely, please contact Dave Pearson to attend Zoom classes
SIG Meetings	Cancelled indefinitely, depending in part on availability of facilities and when meetings could go forward safely. Some may schedule Zoom events.

Please check the website, email groups and social media for updates.

President's Message

By Barbara Toy

We're almost half way through 2020, with the Summer Solstice coming up fast. Sadly, our lives are still dominated by COVID-19, with no likely prospect that there will be a change in the next few months that will allow us to live our lives without concern about avoiding infection. I've heard some people claim that we're overreacting as a society, but those who have fought the disease themselves or watched helplessly as those they love have fought it or died from it know first-hand how devastating an illness it is. Fortunately for me, I don't have that direct experience, and the accounts I've heard have been of the losses suffered by others, but those accounts are harrowing. For those of you who do have direct experience, you have my deepest sympathy and best wishes.

When it comes to club events, neither I nor anyone on our Board wants to gamble with the lives and health of our members – we want you around for the long term, enjoying the sky and all that's up there for years to come. If some folks think we're being too cautious, please consider that the majority of our members are over 60, many are well over 70, and many have conditions that put them at higher risk. Those are factors we can't safely ignore.

General Meetings

There are a number of areas where we don't have any choice about having to make a change, such as our general meetings. Chapman University has generously allowed us to use its Irvine Auditorium for our meetings for years, but the campus currently remains closed to all group events including ours, and they don't yet know when on-campus meetings can resume. At this point, we don't expect that we will be able to meet there until sometime after classes resume in September at the earliest, and we may not be able to have any live meetings through the rest of the year.

Reza (our Vice President and Webmaster) has been able to shift gears successfully with his speaker line-up, and we are now having our general meetings online using Zoom, as I mentioned last month. One benefit of going to virtual meetings is that he has been able to get us some speakers who most likely would never have made it to a live meeting because of distance (such as our May speaker, who is in Northern California). For June, as you may have noticed on the front page of the newsletter, the speaker is Dr. Karin Sandstrom from the University of California, San Diego, on different aspects of space dust¹ (without which we wouldn't exist); the "What's Up" presentation will be by our own Chris Butler, also of Griffith Observatory.

For those who don't have experience with Zoom, it's pretty easy to join a meeting on it. To limit the chance that trolls will try to interfere, Reza doesn't make the link available until shortly before the meeting. To join the meeting, go to the meeting page on our website (on the Home page, click "View Meeting Info" and that'll take you to the right page). He'll put the link there (at the bottom of the column titled "Details"), and all you have to do is click on that. If you don't have Zoom already installed, it will prompt you to install it, but then it should take you directly to the correct location. If you have any problems or questions, please email Reza: reza@ocastronomers.org. As always, our meetings are free and open to the public, so you don't have to be a member to attend any more than if we were having them at Chapman. If you know anyone who might be interested or could use some distraction, please feel free to invite them to the meeting – at this point, we don't have any effective limit on the number of people who can join it.

¹ I never thought much about dust, other than as a nuisance, until I read a great book by Hannah Holmes, *The Secret Life of Dust*. It turns out there's an unbelievable amount of dust, including cosmic dust, in the air around us, and it has much more impact on us than just forming dust bunnies. I'm looking forward to what Dr. Sandstrom can tell us about dust on a cosmic scale.

Other Meetings

Because of the way Zoom is set up, even though we have a club account, Zoom needs to have the account run by a specific individual, and that individual needs to be present for all events on that account. For the club, that individual is Reza, as he was the one who worked everything out and set it up, plus it was a natural fit for him in his roles as Vice President and Webmaster. That is working out really well for the general meetings, in particular, and it's been great to have him able to participate more regularly.

An additional virtual meeting we want to try out is a less formal, more social event, with the first one tentatively planned for a Sunday in June. This concept is still a work in progress, so keep your eye on the website for more information as it becomes available.

In other areas, Dave Pearson has been working with Reza to do the Beginners Class online, and Bob Sharshan has expressed interest in trying it for meetings for the Astrophysics SIG. I'm not sure what plans are being made for the AstroImage SIG, but if they have a speaker lined up doing that by Zoom would certainly be an option.

Unfortunately, Reza's time can only be stretched so far, so I don't know if the club's Zoom account can be used for much beyond this. However, if you'd like to schedule something yourself, maybe a virtual star party for you and some friends, or just a session with some friends to visit with each other and natter about astronomical topics, Zoom does have a free version that is more limited but may work fine for what you're planning. At this point, that's the platform I'm most familiar with, but there are other services that can be used to get a more social feel to an event than just having a phone conference. Since we can't get together with fellow enthusiasts in person right now, it's important to use these various tools to help maintain social contact in this time of social distancing.

Star Parties

Although Orange County Parks is in the process of reopening trails and parking lots, as of this writing they don't know when they will be able to allow group events such as our Orange County Star Party. Steve Mizera is keeping us advised of the status on this.

Our formal Anza star parties have been cancelled for the foreseeable future. For those who go to our Anza site during this time, whether for stargazing or to help with maintenance, it's important to remember that we don't have the resources to deep clean or sanitize the facilities there, so please bring sanitizer and other means to clean the areas you use or come in contact with for your own safety and the safety of others – in other words, please clean both before and after you touch or use something. Please also follow the CDC guidelines, including staying at least six feet away from anyone else at the site and use masks and gloves as much as possible.

At this time of year there are other dangers on site as well – please be aware that the site is in rattlesnake and black widow country, there is a large rodent population, and coyotes and other large animals periodically wander through the site (also neighborhood dogs), so please take precautions so you don't have any unfortunate interactions with local wildlife.

And please, if you're out at Anza, clear any weeds in the area you're using. Gary Schones has generously volunteered to work on repairing the road leading to the site and to clear as many weeds as he can from the common areas – we're very grateful to him for that – but he won't be able to get them all so we need all members who go out there to lend a hand.

Please be safe, stay well, and enjoy the sky whenever and however you can!

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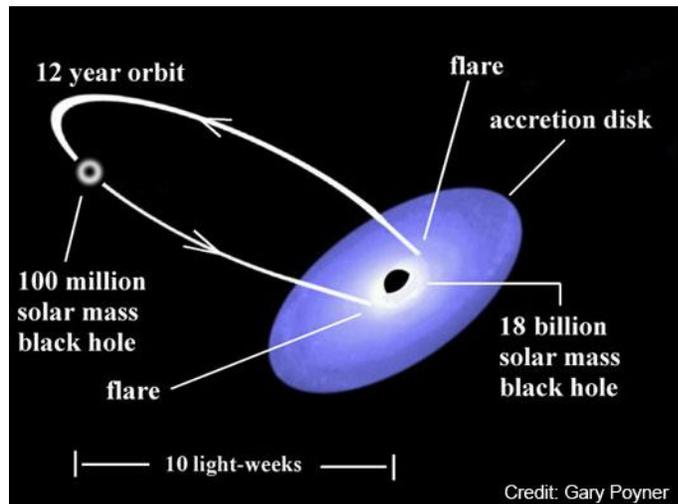
AstroSpace Update

June 2020

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

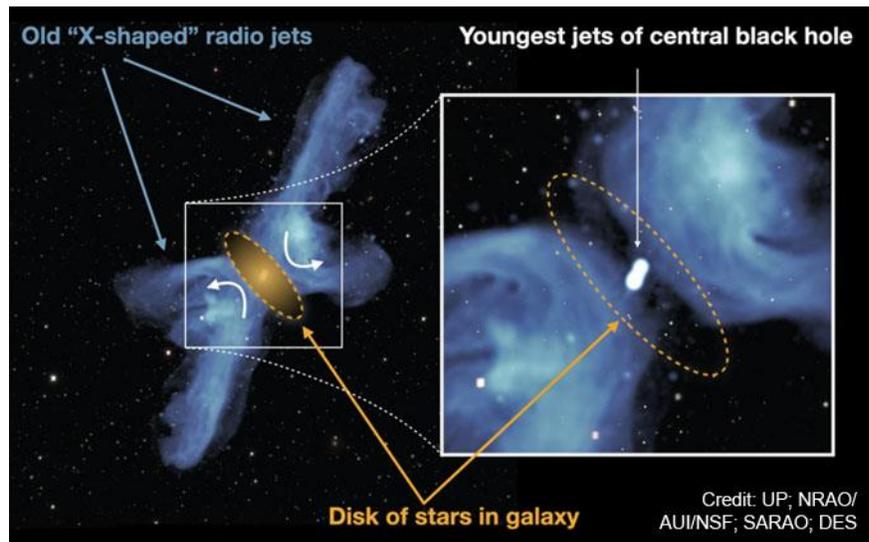
General Relativity – While Newton’s formula for gravity yields elliptical shapes for orbits, General Relativity dictates that orbiting bodies follow an ellipse that moves. Each time around an orbit, the ellipse has advanced a little bit, rotating about the main mass. This advancing of the orbit is known as Schwarzschild precession. In most cases this precession is negligibly tiny, but in extremely strong gravity, it shows up. Since Mercury is orbiting in the strongest gravity of the Sun of any planet, it is the only one whose orbit shows the effect of General Relativity. Astronomers using the Very Large Telescope (VLT) in Chile have for 27 years been tracking the movement of several stars orbiting the supermassive black hole at the center of our galaxy. A recent analysis of one of these stars, known as S2, which passes quite close to the black hole, shows that it is indeed following the path given by General Relativity. S2 takes 16 years to complete each trip around the black hole. This is the 1st time that Schwarzschild precession has been measured for a star orbiting a supermassive black hole. The same team of astronomers 2 years ago announced that they had detected the gravitational red-shifting of light from S2, another effect of General Relativity.

No-hair Black Holes – Archived images show that a galaxy known as OJ 287 has been occasionally experiencing bright periods over the past century. Eventually it was noticed that the bright periods occurred twice every 12 years, but with varying intervals between the pairs. 10 years ago, scientists proposed a theory that 2 supermassive black holes were orbiting each other with a period of 12 years, and that the smaller black hole smashed through the accretion disk of the larger twice on every orbit. The smashing creates a huge flash of light, brighter than a trillion stars. Because the orbit precesses, the timing of the smashes changes. The theory predicted the flash of December 2015 within about 3 weeks, so the theory gained some acceptance among astronomers. 2 years ago the computer simulation of such a system was refined, and the result predicted the next smash to occur on July 31, 2019. Unfortunately, on that date, the galaxy was too close to the Sun to observe from our viewpoint on Earth. But the Spitzer Space Telescope was in a position far from Earth and so was able to observe OJ 287. The flash was right on schedule. The simulation took into account General Relativity effects on the orbit including the loss of energy through emitting gravitational waves. Unfortunately the frequency of those waves is not detectable by any existing or planned gravitational wave detectors. More than 50 years ago scientists including Stephen Hawking proposed the “no-hair” theorem, which stated that the event horizon of a black hole is smooth. Others had proposed that it was lumpy. Such lumps would change the tidal forces of close pairs of massive black holes enough to change the timing of the OJ 287 flash. The observation by Spitzer was at the time predicted for smooth black holes, so it supports the no-hair theorem. These black holes are extremely massive: one at 18 billion times the Sun’s mass, and the other one “only” roughly 150 million Sun’s masses. The big one is probably the 12th most massive black hole known. OJ 287 is so distant that it takes 3.5 billion years for its light to reach us.



Unequal Mass Black Holes – About 10 confirmed cases of black hole mergers have been detected by the LIGO and Virgo gravitational wave detectors, and dozens more candidates await confirmation. All of the confirmed cases were the result of merging of 2 black holes of roughly equal mass, until now. An event from April 2019 was just announced to be the result of black holes of 8 and 30 solar masses merging. It had been predicted, based on General Relativity, that merging of unequal masses would create overtones, that is, higher frequencies, in the gravitational wave. Indeed this was found. Estimates of the distance of this event range from 1.9-2.9 billion light-years away. The overtones also contain information not present in previous events regarding the spin of the more massive black hole and the angle at which we are viewing their orbit. The detection of this event was made possible by recent upgrades to both LIGO and Virgo, including improving the sensitivity of the lasers used. These upgrades have allowed the latest observational run to detect event candidates at a rate of about one every week.

X Jets – A number of supermassive black holes are known that have a pair of jets shooting material out in opposite directions at very high speed. But a few have jets in 4 directions, forming more of an “X” shape. Several explanations have been proposed, such as jet direction changes and double black holes. New observations settled how the X is formed in one case, that of galaxy PKS 2014-55. The longer axis of its X extends 2.5 million light-years in each direction. Observations using the MeerKAT radiotelescope array in South Africa showed that the longer axis is composed of the 2 jets shooting



material out, but also superimposed on that is jet material that lost its velocity due to hitting intergalactic gas and is falling back along similar paths. There is a region of higher pressure gas near the center of the galaxy that deflects fall-back material into shooting out at new angles. Hence the shorter arms of the X. PKS 2014-55 is about 800 million light-years away.

Exoplanet Undiscovered – Remember when, in 2008, astronomers released pictures showing a planet orbiting the star Fomalhaut? Well, forget it. Astronomers have been unable to find that planet for the past 6 years. Finally a team of researchers came up with an explanation of how they could lose a planet: it wasn't a planet, but a cloud of dust orbiting Fomalhaut, which then dissipated to the point where the cloud was too dim to be imaged. This explanation seems to best fit all the observations, including its fading, its eccentric orbit, and the fact that it was never visible in certain infrared wavelengths. The cloud of dust was probably the result of a collision between dusty icy bodies orbiting the star. It was calculated that it would take a couple of objects about 125 miles across colliding to make a dust cloud of the brightness seen. Fomalhaut is just 25 light-years away.

Resonant Exoplanets – A team of researchers has announced the results of analyzing years of spectroscopic data regarding the star HD 158259 in Draco. The wobbles in the motion of the star indicate that it has 6 planets orbiting it. The innermost one is a little larger in mass than Earth and the other 5 are each somewhat smaller in mass than Neptune. Searching TESS (planet-finding space telescope) data showed that the innermost planet transits (passes in front of) its star. All of the 6 planets are near, but not exactly in 3:2 resonances; that is, each planet makes 3 orbits in (about) the time that the next planet outward makes 2. The whole system orbits quite close to the star. All their orbits would fit well within Mercury's orbit in our Solar System. It is thought that the planets formed farther out, but migrated inward until each reached a resonance with the next planet in, and eventually migration stopped. However, since that time, disturbances of some sort have changed their orbital periods slightly away from resonance. Only about a dozen planet systems are known with 6 or more planets.

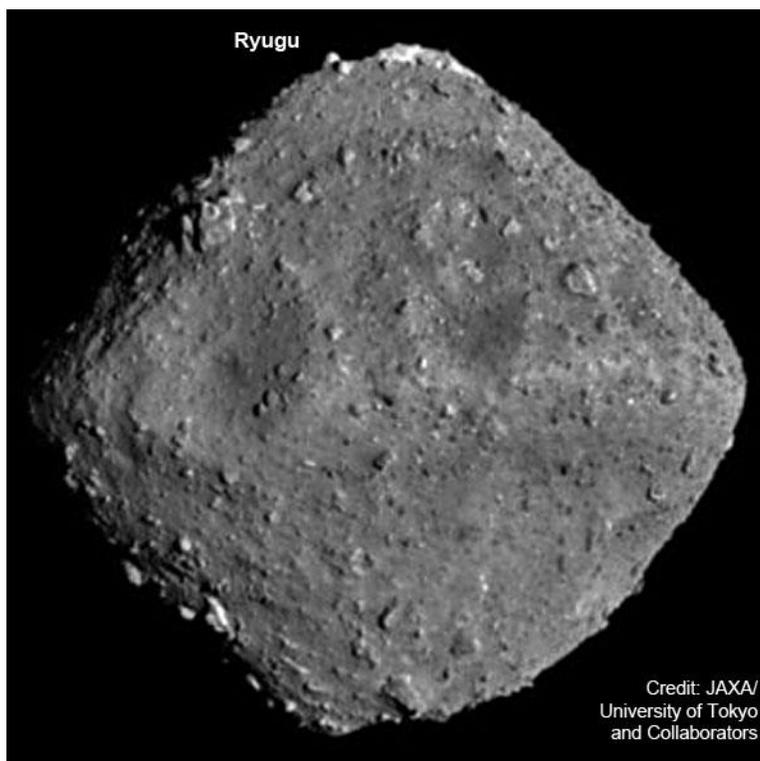
Delta Scuti Variables – The TESS spacecraft was designed to observe exoplanets transiting stars, but it was realized that asteroseismologists would love the data also. Asteroseismology studies the brightness changes of stars' surfaces to learn what structures inside have been encountered by sound waves bouncing inside the star. A study has been made by asteroseismologists of stars known as Delta Scuti variables found in the TESS data. These stars pulsate, but in complex ways that are not understood. They rotate quickly enough (once or twice a day) that they bulge out into elliptical shapes, which mixes up the way the surface brightens. Out of about 1000 such stars, 60 were found to be pulsating in ways that are now understood. Some of them globally swell and then shrink, and some of them swell and shrink only on one side at a time. It was posited that these 60 differ from the others because of the angle we are viewing them. But also, it was found that these 60 tend to be younger stars. In any case, this is a beginning to better understanding this class of variable stars. One of the studied Delta Scuti variables is located in a stream of stars flowing around our Milky Way. Previous attempts to find the age of the stream had come up with 2 widely differing results. The age of the Delta Scuti variable was found to agree with the younger of the candidate ages for the stream, 120 million years.

Cloudy Brown Dwarf – Using observations in polarized light made by the VLT in Chile, astronomers have found what appear to be cloud bands on a brown dwarf, a star too small in mass to sustain the nuclear fusion that powers ordinary stars. Though cloud bands have been detected on brown dwarfs before, by analyzing changes in brightness, this is the 1st time such were found using polarized observations. The brown dwarf is called Luhman 16A, which orbits its companion brown dwarf (you guessed it, Luhman 16B). They are only 6.5 light-years away. The team hopes to use similar polarized observations on exoplanets also.

Stellar-mass Black Hole – A study of double stars has found that a pair known as HR 6819 also orbits a 3rd body, which is at least 4 times the Sun’s mass but gives off no light. The conclusion is that it is a stellar-mass black hole. It is about 1000 light-years away, making it the closest to us known black hole. The double star can be seen naked-eye as a 5th magnitude single object, since the components are too close to resolve. But it is far south, so don’t try to observe it without traveling to lower latitudes. It is thought based on supernova rates that there should be far more stellar-mass black holes than are known, but astronomers usually find only the few that happen to be swallowing matter and therefore emitting X-rays. There are fewer than 20 known good candidates to be stellar-mass black holes in our galaxy.

Nearby Possible FRB – Astronomers announced that they had found the 1st fast radio burst (FRB) ever seen to originate within our Milky Way galaxy. Because FRBs last only fractions of a second and occur at random places in the sky, the sources have been difficult to pin down. The few that have been located originated in other galaxies. It is not known what kind of object within those galaxies emitted the bursts. This new discovery very likely originated from a magnetar, an extremely magnetized neutron star, known as SGR 1935+2154. It was seen to be flaring in X-rays at the time of the radio burst. Immediately after pinning the source to this magnetar, some astronomers pointed out that the energy emitted by an object so close had to be about 1000 times less than any other FRB. This raises a lot of questions: Is this observation of something other than an FRB? Do FRBs span a huge range of energies, so this is simply a weak FRB? Are FRBs emitted only along a beam, and this one appears so dim because we are out of the beam? This now-termed “FRB-like” burst has already been seen to repeat (most FRBs have not been found to repeat), so we may learn more about it with continued observations.

Ryugu Report – The Hayabusa 2 spacecraft is on its way back to Earth after spending about 17 months at the small asteroid Ryugu (less than a mile across), and the spacecraft is carrying samples back. A report was just released regarding what was found on the mission. It answered some questions and raised others. Ryugu’s poles and equator are slightly bluish and the mid-latitudes slightly reddish and darker. It is believed that heating, solar wind and meteoroid impacts will slowly redden such surfaces. The mid-latitudes are lower elevation than the poles and equator (because Ryugu is strangely shaped), so the reddened material likely just drifted to low spots. Examining impact craters showed that the reddening is several yards deep. Crater counts in the reddened areas allowed an estimate of when the reddening occurred, and that estimate ranges from 300,000 to 8 million years ago, depending on where in the Solar System Ryugu was when the crater’s impacts occurred. This reddening may have occurred as an event caused by a close pass to the Sun, rather than slow reddening over a long time period, because of the lack of partly reddened areas. Two methods of determining Ryugu’s age came up with widely differing numbers, so more work is probably needed on its age. Testing the samples in labs on Earth will likely help settle this. The minerals observed on the asteroid seem to have little water involved, but just why that is remains a mystery.



Venus Super-rotation – Researchers analyzing data from Akatsuki (Japanese spacecraft orbiting Venus) believe they have found why Venus’s atmosphere super-rotates, that is, the atmosphere circles the planet much faster than the ground rotates. Because Venus is the slowest rotator of our 8 planets, taking 243 Earth days per rotation, it seems it would not be hard for the atmosphere to rotate faster. But it’s about 60 times faster, particularly at high altitudes, and that takes considerable energy to accomplish. The new finding is that the super-rotation is powered by waves of atmosphere moving from the heated area under the Sun to the far side, but only at low latitudes. Atmospheric turbulence and other types of waves push the atmosphere nearer the poles into super-rotation.

Hexagon Haze – Astronomers have been watching the Saturn hexagon since the 2 Voyager spacecraft visited in 1980. The hexagon pattern in clouds about the north pole barely moves with respect to the planet itself, even though the jet stream winds in it do move at about 250 mph. There is no other known structure like it. A new study of archived Cassini images of the limb of Saturn show the hexagon has at least 7 haze layers over it, stretching to more than 180 miles above. Each haze layer is between 4 and 11 miles thick. The layers are believed to be formed by gravity waves (not to be confused with gravitational waves), which are oscillations in density and temperature that often form in atmospheres.

From the Editor

Sirius wants photograph submissions from club members

We need submissions for this year. I will also pull some from the OCA members images section on our website but those will be at my discretion. If you would like your picture on the cover, please send it 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 and / 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

<u>Issue</u>	<u>Due date</u>
June	23 May
July	20 June
August	25 July
September	22 August

OCA Loaner Scope Program

From John E. Hoot, Program Director

Due to the CoVid-19 pandemic, the OCA Telescope Loan Program is on hold. Those of you who have telescopes checked out are encouraged to continue to enjoy them rent free until such time as it is deemed safe to resume the scope exchanges.

I am still accepting reservations for scope checkouts when the program resumes but no firm date has yet to be set. Please see the current inventory list below. If you have questions I can be reached at scopes@ssccorp.com.

INV#	Type	Size	Mfg	Model	Accessories/Notes	Status
Active Inventory						
1	Mac	3.5"	Meade	ETX90	Alt/Az Goto	Available
2	Newtonian	4.5"	Meade	DS2114ATS	Alt/Az Goto	Available
5	SCT	8"	Meade	LT8	Alt/Az Goto	Available
6	Newtonian	4.5"	Celestron	1114EQ	Wt Bars In Storage	Available
10	SCT	8"	Celestron	Orange Tube	w/Encoders, Wedge, Tripod & SlowMo. Ctl	Available
16	SCT	10"	Meade	LX200 Classic	Alt/Az Goto	Available
17	Newtonian	8"	Celestron	????	electronics not working	Available
19	Mac	2.25"	Meade	ETX60	Alt/Az Goto	Available
20	Reflector	8"	Orion	SkyView	German Mount w/Tracking & SloMo 2 axis	Available
22	Reflector	4.5"	Celestron	NexStar	Alt/Az Goto	Available
24	Reflector	4.5"	Meade	4504	German Mount Goto	Available
26	Dobsonian	8"	Celestron	Starhopper	Alt/Az Manual	Available
29	Schmidt-Cas	8"	Celestron	NexStar 8	Alt/Az Goto	Reserved
31	MAK-Cas	5"	Meade	ETX-125	Alt/Az Goto	Available
32	Newtonian	4.5"	Meade	DS-114AT	Alt/Az Goto	Available
33	Schmidt-Cas	10"	Meade	LX90-AFCF	Alt/Az Goto	Reserved
34	Dobsonian	12"	Meade	Light Bridge	Alt/Az Manual	Available
35	Newtonian	4.5"	Meade	DS-2114	Alt/Az Goto	Available
36	Schmidt-Cas	8"	Celestron	Ultima 8	Fork Mount w/Wege, Tripod Motorized	Available
37	SCT	8"	Meade	LX200GPS	Needs Spreader & Handbox	Available
45	Refractor	4"	Tashihaki	106FSQ	Motorized German Mount AstroImaging	Available
49	Dobsonian	4"	Orion	Dobsonian	Table Top Dob - Easy to use	Available
Available For Purchase						
39	Black C8 OTA	8"	Celestron		OTA Only	\$250
41	SCT	14"	Celestron	C14 Classic	w/Wedge, and Tripod	\$1,200
48	SCT	12"	Meade	LX200 Classic	Az/EI Goto w/Tripod (no wedge)	\$1,200
50	Dobsonian	10"	Orion	Classic Dob		\$200
51	Dobsonian	12"	Odyssey	Red Tube Dob		\$250

Email: scopes@ssccorp.com with question or for details

Scope Pickups are on hold

More Images from the Club

Here are a couple more pictures from the club archives to remind us of the beauty in our night skies that we can see with naked eyes, though perhaps a little better when using binoculars.



NGC869 and NGC844 the double cluster taken by Don Lynn



Pleiades open cluster (M45) taken by Jim Windlinger

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