SIRIUS ASTRONOMER

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The Newsletter of the Orange County Astronomers

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John Castillo captured this image of Comet 21p at 4:00 a.m. from the OCA Anza site on 9-9-18. A modified Canon 5D MII was used on a FSQ106 mounted on an AP1200. Exposure time was 2.5 minutes.

OCA CLUB MEETING

The free and open club meeting will be held on Sept 14 at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange.

This month, Nathan Whitehorn on First Evidence for a High-Energy Astrophysical Neutrino Source with IceCube.

NEXT MEETINGS:
October 5 – Simona Murgia
November 9 – George Becker

STAR PARTIES

The Anza site will be open on Sept 8. The Orange County site will open on Sept 15. Members are encouraged to check the website calendar for the latest updates on star parties and other events.

Please check the website calendar for the outreach events this month! Volunteers are always welcome!

You are also reminded to check the web site frequently for updates to the calendar of events and other club news.

COMING UP

The next sessions of the Beginners Class will be held at the Heritage Museum of Orange County at 3101 West Harvard Street in Santa Ana on Sept 7 and Oct 12.

Youth SIG: contact Doug Millar

Astro-Imagers SIG: Sept 6

Astrophysics SIG: Sept 21, Oct 19

Dark Sky Group: contact Barbara Toy

President's Message

By Barbara Toy

Well, here we are at the beginning of another school year, heading for the Autumnal Equinox and, hopefully, cooler weather. It's been an eventful as well as an unusually hot summer…

July and August Fires

Around the time of our August star parties there were large wildfires near Idlewild (the Cranston fire) and in the Santa Ana Mountains west of Elsinore (the Holy fire) that (besides the much more serious damage they caused to in their immediate vicinities) sent smoke over our Anza site, interfering with viewing and imaging even though they were both a good distance from us. With that and traffic problems getting out to the site (Ortega Highway was closed due to the Holy fire, increasing traffic on other routes), turnout for the August star party was much lower than usual. Unfortunately, the Holy fire also caused our Orange County Star Party to be cancelled, as the site where we hold it had to be closed.

Both fires caused a lot of damage, though fortunately no loss of life, including 2½ miles of power transmission lines and supporting structures destroyed by the Cranston fire. That caused us to lose power at the Anza site for 10 days (the entire Anza valley area was without power). Our power comes from Anza Power, a cooperative that gets its power from Edison, which owns the damaged transmission lines. Once they could safely get in to make the repairs, Edison had crews working around the clock and actually finished the repairs a couple of days earlier than they estimated – from the information posted about it on the Internet, it was a massive job under difficult conditions, and a lot of it was in areas that could only be accessed by air or by hiking in over rugged terrain. Considering the challenges (including the fact that there were still areas that were actively burning) and the scope of the damage, it's pretty amazing they were able to get the repairs done so fast.

Anza Power did its best to reduce the impact of the power outage, bringing in several industrial generators to provide power to its customers on a rotating basis. One problem in our area is that everyone gets their water from wells, which are accessed by electric pumps, so no power means no water. Having power for a couple hours every day or two at least allowed the storage tanks to be filled, though it didn't do much for helping people stay cool in the blistering temperatures we had through that period. Unfortunately, the power cycling wasn't without its problems – our well pump was a casualty, failing shortly after power was fully restored, but it's been repaired so we do have water at the site.

Another problem from the loss of power at the site was that there was a lot of food that had been left in the refrigerator and freezer at Anza House that went bad. Fortunately, a very generous and industrious club member who has chosen to remain anonymous discovered the situation and cleaned it up, taking all of the rotting food and disposing of it. Needless to say, everyone on the board is deeply grateful, and, while we honor the request for anonymity, we really wish we could show our appreciation more publicly. The condition of the refrigerator and its contents was very unpleasant when it was found, but would have been far worse if it hadn't been discovered and dealt with until closer to the star party.

Moral of the story: please don't leave food in the refrigerator when you leave the Anza site. Though this power outage was unusually long, we often have shorter power outages that can cause food left in the refrigerator or freezer to spoil, and any food left out there can also attract rats and mice.

When Alan and I went out to the Anza site the week after the star party, Ortega Highway was open, but we could see a couple of ridges that were still burning from the Holy fire, and we could see extensive areas where the fire had burned down toward Elsinore north of Ortega Highway. It was a stark reminder of just how vulnerable we all are to brushfires in Orange County as well as near our Anza site. We still have several months of formal fire season to go – hopefully we'll get through it without any further fires close enough to impact any of our members directly.

Welcome to Helen Mahoney as Trustee

Helen Mahoney is a past president of the club as well as a past trustee, and has been attending board meetings regularly for the last couple years though she wasn't a formal member of the board, giving us the benefit of her experience and insights on various issues we've considered. I'm really delighted to be able to tell you that the board unanimously selected her to fill the trustee position that Greg Schedcik had to give up do to his increased work responsibilities.

Helen and her husband, Doug Millar, were active in the administration of the club in the 1990s, before I became a member, and were involved in important developments for the club that took place in that period, including the installation of Anza House on our Anza site and the working out and adoption of the current licensing arrangement for the member pads and observatories at the Anza site; this was actually finalized during Helen's presidency. I remember reading a memo she wrote describing the arrangement and why it was adopted soon after I joined the board myself, and being impressed by both the information provided (which has been useful throughout the time I've been on the board) as well as the person who wrote it – I didn't have the privilege of knowing her at that point, but have really enjoyed getting to know her over the years since then.

Helen and Doug left their board activities as they were busy with their careers and other aspects of their lives, and they have accumulated even more knowledge and experience than they had back then. It was a real pleasure when Doug decided to join the board again a couple of years ago, particularly when Helen joined in our meetings as well – we essentially got the benefit of two knowledgeable and experienced trustees for one position. I am really glad she is rejoining the board formally, which is great for both the club and the board.

So please let Helen know you're glad we have her back on the board next time you see her – we're all looking forward to working with her!

A Night on the Kuhn

One of benefit of being a Star Member is that you can reserve the Kuhn telescope and the observatory for your own use for an evening, and can have your own little star party. That's what Pat Knoll did on the 1st quarter moon weekend in August, and some of us other Star Members joined in, Joe Busch, Trey McGriff and me, with Wayne Peters and Alan along to help out as well. The occasion was to introduce some wonderful folks from the San Diego Natural History Museum to an aspect of the natural world they hadn't really experienced – exploring the night sky. It was also to thank them for the really fine memorial they organized at the museum for Paula Knoll, Pat's wife, who had been an active volunteer at the museum for over 30 years.

Usually we expect viewing to start after dark, but Trey got Saturn in view in the Kuhn while the sun was still up, so we started early. We also spent time on the moon and Jupiter in daylight and returned to all three along with Venus and Mars as it got darker, adding other objects as it got dark enough to see them. Joe got the two LX200s running, so we had them as alternative viewing stations as well.

Because of the moon we couldn't really show them galaxies – Andromeda looked like a bright spot with a bit of fuzz around it but no detail, and the Whirlpool just showed the two galaxy cores without any fuzz at all. Globular clusters away from the moon showed up well, as did double stars like Albireo and bright planetary nebulas like the Ring, and they enjoyed them, but what they enjoyed more was the planets – even Mars showed some detail in spite of the dust storm that's been obscuring its surface during this particular close approach. And they really enjoyed looking at the moon…

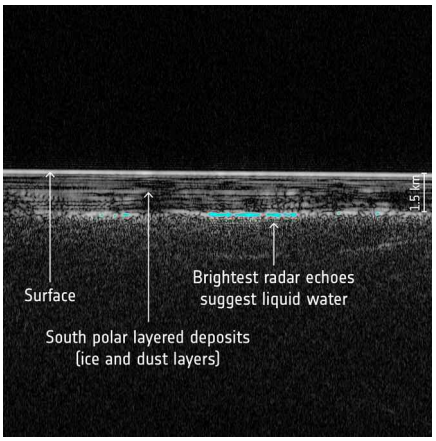
Now, you don't need a light bucket to view the moon, which is one reason Joe had it in one of the LX200s with a filter, but the view through the Kuhn of an area by the Apennines (I'm going by the identification made by others here, as my moon geography is not reliable) near the terminator through a zoom eyepiece and a polarizer was pretty spectacular – we were lucky that the night was steady enough to take some good magnification, so the craters and their central peaks really stood out, as did other peaks and features. It's been a long time since I played around on the moon that way, but it was a natural and very enjoyable development given our guests' enthusiasm.

It was a truly fun evening. Pat, Trey and Joe in outreach mode and playing off of each other is always fun as well as informative, and seeing our guests' responses to what was in the eyepiece was a good reminder that the brighter objects out there can give very satisfying views – not the same as picking out dim fuzzies on a really dark night, but excellent in their own way.

Whether you're going for bright or dim objects, or both, may your next viewing session be blessed with clear, steady skies – and no smoke!

AstroSpace Update

September 2018
Gathered by Don Lynn from NASA and other sources



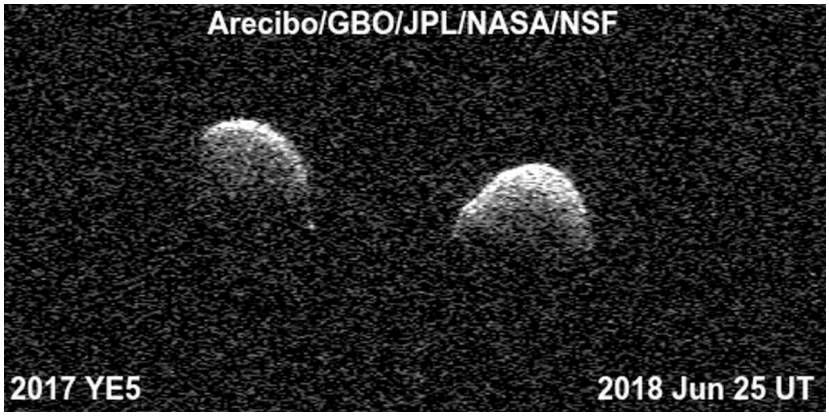
Credit: ESA/NASA/JPL/ASI/Univ. Rome; R. Orosei et al 2018

Martian Lake – The ground-penetrating radar aboard Mars Express has detected a layer below the Martian south polar cap that is likely a liquid water lake. There are lakes known buried deep within Earth's south polar cap, so this would not be without precedent. The layer has different radar reflectivity than ices or dirt, and matches what is expected of liquid water. Estimates of the temperature and pressure under Mars' polar cap indicate that a lake there would have to be extremely salty to remain liquid, but it is within the range of possibility. Mars Express has been radaring the polar caps for over a decade, but didn't have the resolution to see this layer. But spacecraft controllers recently reprogrammed the radar to raise its sampling rate and therefore resolution. The probable lake is at least 12 miles wide. Only a small area of the polar cap has been examined with the radar at high resolution, so other lakes may exist.

Martian Dust – Every few years, on average, Mars has a planet-wide dust storm. One is occurring now as I write this. So where does that much dust come from? A new study of Mars Odyssey data shows that the sulfur and chlorine content of the Medusae Fossae Formation (MFF) matches the content of those elements that the rovers found in dust that fell on them. No region other than MFF was found to have those elements in matching amounts. MFF was formed by huge amounts of gassy volcanic eruptions about 3 billion years ago. Since then, wind erosion has reduced a large amount of this lava to dust. The layer of dust there is estimated to be hundreds of yards deep. So the answer is that much, perhaps most, of the dust involved in huge Martian dust storms came from MFF.

Solar Probe Launched – In 1958, astrophysicist Eugene Parker predicted that scientists would find particles being thrown off from the Sun at fairly high speeds, later called the "solar wind". This wind was found and measured by many spacecraft over the past 60 years, so a few years ago NASA decided to develop a spacecraft that would examine the solar wind where it formed in the upper atmosphere of the Sun. Last month Parker, now age 91, watched his first rocket launch, that of the Parker Solar Probe. It is the first time NASA has named a spacecraft after a living scientist. After several flybys of Venus to alter its orbit, the Probe will make it 96% of the way from Earth to the Sun. That's as close as it dares to get, considering the tremendous heat and particle radiation. In October, after spacecraft testing, the Probe should begin returning data on the Sun. At about the same time it will make its first flyby of Venus. In November it will make its first fairly close pass by the Sun, and continue in a very elliptical orbit that allows further Venus flybys. Its closest pass by the Sun, a few years from now, will be 7 times closer than any other spacecraft has ever endured. It will then be traveling about 430,000 mph, far faster than any previous spacecraft. The craft will try to answer questions such as why the Sun's corona and wind are far hotter than the surface and how particles are accelerated away from the Sun to very high speeds. The craft's instruments measure magnetic fields, plasma and energetic particles, and take images.

Binary Asteroid – Surveys of asteroids that come near enough to Earth to be well imaged show that 15% of them are binary. However most of those consist of a tiny object orbiting a much larger one, making binary equal-sized asteroids fairly rare. Radar observations of asteroid 2017 YE5 during its recent approach near Earth showed that it is the 4th known equal-sized binary. The 2 components revolve about each other in a little less than an Earth day. They were found to be larger than expected, which means they are darker than expected (previous size estimates were based on brightness alone.) The radar reflections of the 2 differ considerably, meaning they are of different surface roughness, composition or density.



Jovian Moons Found – Ten new moons of Jupiter were found, bringing the total to 79 known moons there. You may see headlines elsewhere about 12 new moons, but those count 2 that were announced months ago. The observations were made not to find moons, but to find objects in or beyond the Kuiper Belt, such as the proposed Planet Nine. But Jupiter got in the way, and there appeared the 10 objects following Jupiter. As is typical for Jupiter moons, the ones closer to the planet orbit in the prograde direction, while the farther ones orbit retrograde, with one exception. That one orbits prograde right among a bunch of previously known retrograders. Someday this will cause a big collision. In fact, the newly discovered outer moons seem to belong to 3 groups that each have similar orbits. This says that sometime in the past, 3 larger moons had such collisions, busting them up into smaller objects with similar orbits. The newly discovered moons take about 1-2 Earth years to orbit the planet. All are very small: ½ - 2 miles in diameter, which is why they were not seen before.

Galaxy Collision – A new study of the halo of stars about M31 the Andromeda Galaxy and its companion M32 show that M31 was hit by another galaxy about 2 billion years ago, and M32 is the core of that collider. The rest was shredded and thrown out into the M31 halo and a stream of stars. The collider was large, somewhere between the sizes of M33 and the Milky Way. It had been thought that the stars thrown into the M31 halo came from numerous collisions with small galaxies, but this study showed most of those stars came from a single galaxy. M31 was known to have had a burst of star formation about 2 billion years ago, and it was likely triggered by this collision.

Gap in the H-R – Astronomy courses always introduce the Hertzsprung-Russell (H-R) diagram, where the brightnesses of many individual stars are plotted against the stars' colors. Most stars fall on a diagonal strip known as the main sequence. Stars there are nuclearly burning hydrogen into helium. The strip appears continuous, that is, containing stars of every brightness in the range. The Gaia spacecraft recently released detailed information on more than a billion stars it has observed. So some enterprising astronomers took 4 million of the closest stars in the Gaia data (close stars have the most accurate brightness measurements) and made an H-R diagram. The main sequence ISN'T continuous. A small strip of brightness down in the area of red dwarf stars is missing. Theorists immediately explained it. Very small mass red dwarf stars are known to be entirely convective. That is, hot material from the center, where nuclear reactions generate heat, rises all the way to the surface. But somewhat larger red dwarf stars don't get convection working in their centers, only their outer layers. Heat at the center rises by radiating instead of convection. The transition between stars entirely convective and those only partially convective creates an instability that results in there being almost no stars of a particular brightness. It's nice to discover a phenomenon that already had a theoretical explanation waiting.

Eta Carinae – Between 1837 and 1856 the star known today as Eta Carinae underwent an outburst, becoming for awhile the 2nd brightest star in the night sky. Spectra were taken over this period, which were found to change like nothing seen before. Ever since, astronomers have been trying to explain the outburst and the spectra observed. A new study has a theory that fits pretty well. The study was based on observations of light echoes around Eta Carinae. Light echoes occur when light bounces off material in the space surrounding a star, thus arriving later than direct light. So observing a light echo is observing the past. By taking spectra and images of echoes farther and farther from the star, a time history can be created. Eta Carinae is a double star. But the new theory says it was a triple, and that 2 of the stars merged. To match all the light echo observations, one of the stars had to dump material onto a 2nd star before the merger. The merger exploded material outward that collided with material thrown off earlier. Further work is needed to confirm that we finally have an explanation for Eta Carinae.

CHIME – is a radiotelescope in Canada with unusual design. Its antennas are cylindrical and are permanently fixed to the ground, with no mechanical pointing ability. It was designed to map the hydrogen gas over much of the Universe. It continuously monitors a large range of radio frequencies and a large portion of the sky. This makes it perfect for searching for Fast Radio Bursts (FRBs). Only a few dozen FRBs have ever been seen by all the radiotelescopes in the world, because they occur at random places in the sky and last only milliseconds. CHIME has been in operation for only a few months and has already seen a few FRBs.

Credit: chime-experiment.ca

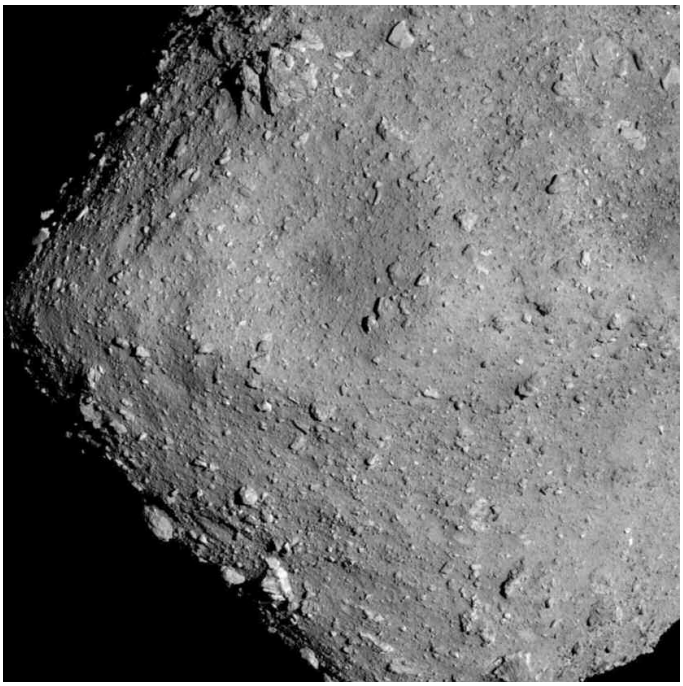
Black Hole Observed – NICER, an X-ray telescope installed on the International Space Station in June of last year, has been observing an X-ray binary star known as MAXI J1535-571. An X-ray binary is a black hole whose orbiting companion star is dumping material into the black hole. The material gets really hot from friction before it disappears into the black hole, and that hot gas produces X-rays. The black hole was found to be rotating at 99% the maximum theoretical speed for a black hole. X-rays have been observed from the accretion disk, from the hot corona above the disk, and from reflections of corona light off the disk. The X-ray spectrum shows that the accretion disk has a warp in it.

Sun's Wild Youth – It is known that young stars tend to be much more active than older ones, throwing off large quantities of atomic particles. One assumes our Sun used to do that in its youth. Now we have proof. Examination of the mineral hibonite found in the Murchison meteorite using a mass spectrometer found quantities of neon and helium trapped in the mineral. They were trapped early in the history of our Solar System when particles thrown off from the Sun struck the forming meteoroid, breaking up the atoms in hibonite into other elements, including neon and helium. The amounts found show that the Sun was far more actively throwing out particles than it is today. Murchison fell in Australia in 1969. Hibonite formed in meteoroids when the temperature of the solar nebula dropped below about 1700 Kelvin, the freezing point of the mineral.

Instant AstroSpace Updates

The Japanese spacecraft **Hayabusa2** arrived at its target asteroid Ryugu in late June and began taking images and other data. It will spend 18 months studying the target, including dropping 4 small rovers onto the surface, then return to Earth with samples taken at and just below the surface.

NASA announced the names of 9 astronauts who will fly on the first 2 missions to the International Space Station (ISS) of both the SpaceX Dragon and the Boeing Starliner spacecraft. These will fly in 2019 or 2020, and mark the **return of American flights to ISS** since the 2011 retirement of the Space Shuttles.



Credit: JAXA, University of Tokyo, Kochi University, Rikkyo University, Nagoya University, Chiba Institute of Technology, Meiji University, University of Aizu, AIST.

NASA's Crew Dragon astronauts were introduced at SpaceX headquarters on Aug. 13. Standing in front of in-progress Crew Dragon, (L to R) Bob Behnken and Doug Hurley (who will fly the first test mission), Mike Hopkins and Victor Glover (who will fly the first operational Crew Dragon mission to the ISS). Credit: Pauline Acalin

Greetings from Palmia Observatory

By George Robinson

Well, our opportunity to observe through the Mount Wilson Observatory (MWO) 60-inch telescope finally came to be. We had been disappointed many times in past and had to reschedule our session due to weather several times and even forest fires when the dome could not be opened due to flying as.

After many attempts to reschedule a diverse group of OCA members, I elected to break off and form a separate group of observers, who were not constrained by the need to schedule weekend only viewing sessions, and we were able to put together another group of twelve observers and our first available date was Sunday, July 8. So we were able to drive up to MWO, with light city traffic and most of our gang didn't have to go to work on Monday morning, so it all worked out just fine.

While we were there waiting, we were entertained by a song and dance routine from Science Nerd and Theatre Impresario, Scott's new Tesla, which raised and lowered its doors and mirrors and lights and sound and went through quite a light, sound and motion show. Thanks for that, Scott!

This meeting at MWO was the first time that many of us had actually been together in person, often just being someone at the end of an email chain, but we all got a long fine. Thanks for that everyone and I know we all had a great time, even though some of us gave up at midnight or before!

Also a young University of Arizona astrophysics graduate student, who was taking a class at Caltech, showed up and just on a chance had driven up the mountain to see if she would be lucky enough to see any of the telescopes. Well, we each had chipped in $85 for every pair of eyeballs, but how can you say no to some interested observer. Besides, I know for me, I really enjoy and have appreciated the discounted conference fee that the professional American Astronomical Society (AAS) gives to amateur astronomers. I often take advantage of that savings and then chose to donate back a portion of my savings to a fund that provides travel expenses so that that real graduate astronomy students can attend these conferences. So, it was great to give back and let her join our group. Besides, she answered many of our astronomical questions and she even showed me how to setup my iPhone so that the display was illuminated in red light rather than bright light. Thanks for all that!

(left) July 8 group of OC Astronomers at Mount Wilson 60-inch telescope. (right) Resident Astronomer Peggy listens to MWO Session Director Evan tell about the 60-inch. (Source: Palmia Observatory)

Part of the success of the evening half-night observing session is the observatory staff who, first of all, escorted us through the observatory gates so we could park next to the 60-inch telescope dome, and then explain the history and help us select available targets for the evening. Our session director, Evan (above right), tells us of the history of the 60-inch dome, constructed in 1908, and helps us inside and lets us go up the stairs to the observing floor.

Getting practice on the observing ladder with Arcturus in the scope at sundown.

Once we were inside the dome and met telescope operator, John, we had a chance to experience what it must have been like for the early astronomers using this instrument. While we were waiting for the sun to go down, we had a chance to climb the ladder and view the bright star, Arcturus, through the eyepiece. Viewing some target objects required us to actually lean out and off the ladder with maybe one foot resting on the telescope so this first practice session was very useful.

Observing sessions on the 60-inch MWO telescope are mostly conducted with viewing through the two available eyepieces, but some time is available to take photos through the eyepieces. Most of our little session group wanted to take photos through the eyepiece and also take some images with our own attached DSLR cameras. While we were still waiting for darkness, I took one image of Arcturus (page 8) without the use of the special MWO adapter and you can see Arcturus and some of the dome lights reflected in the eyepiece.

(left) iPhone image of Arcturus and reflected dome lights at 60-inch eyepiece without adapter. (right) iPhone Image of Jupiter taken through the MWO 60-inch telescope eyepiece. (Source: Palmia Observatory)

When the sky got a lot darker, we moved on to Jupiter. After we all had a chance to view Jupiter through the eyepiece, the MWO staff (Evan and Telescope Operator, John) installed the little adapter that held the phone cameras in place over the eyepiece. The adapter would have prevented any reflections from the dome lights, which by this time were turned off. Take a look at this iPhone image of Jupiter (above). Wow, you can even see a little moon in the image too!

First attempt at M57 Ring Nebula in this 15 second DSLR image on the MWO 60-inch scope. (Source: Palmia Observatory)

Next up, we had a chance to observe some globular clusters through the eyepiece and some nebulas, but we had to wait a bit for objects to show up in locations where the city lights from Los Angeles did not wash out any detail. We especially liked seeing M57, The Ring Nebula, and this was the first object we elected to try our hand at doing DSLR imaging on the MWO 60-inch telescope.

The screenshot (next page) shows the Sky Safari Pro view of M57 with some visible stars. I had adjusted the field of view to match the roughly 3 x 2 arc minute field of view provided by the 60 inch scope. You can also see at least two of the dim stars shown in the actual camera image, even though the field of view is rotated a bit between these two displays.

Have you ever wondered if objects seen through a large telescope like the 60-inch would be brighter than if it were seen through a small amateur scope? Well, I had read in one of my astrophysics textbooks that the image is not actually any brighter. How can that be? We have already seen that in thee DSLR image of M57 that it required long exposure times in this one case of 15 seconds.

Ok, so here is my take on that issue and question. Consider two telescopes, one like the 60-inch telescope with f/16 optics and 960-inch focal length, and another somewhat like a small amateur scope of same f/16 optics, but only with 6-inch reflector. This small scope would then have 96 inch focal length, which is quite long for amateur scopes, but let's use this as an example, just to make the calculations easier.

So the 60-inch scope would gather much more light than the 6-inch scope. The amount of light goes up as the square of the ratio of mirror diameters, so the large scope would capture (60/6)^2 = 100 times as much light. Now we have to ask, how large is the image in these two cases? The image in a scope scales up with the focal length. So the image as seen in a 60-inch scope could have an area that would be (960/96)^2 = 100 times larger. So, yes you gather more light with the larger scope and the image can be larger as well so the image need not be any brighter.

Finally, as many folks were tiring out and Resident Astronomer Peggy and I decided to call it quits just a bit past midnight (ok, ok, so we don't hang out like we used too), we had a chance to see Saturn. Now, in this image and the previous DSLR image, I really couldn't turn the focus knob enough to get much improvement in focus. I turned the focus knob all over the place and couldn't see much difference. So, I left the evening not quite sure if the fuzzy nature of the images was due to focusing or to atmospheric seeing or what.

I did confirm though that by looking at the angular size of the targets, using the 60-inch telescope's focal length of 960 inches, my DSLR camera's sensor size and resultant camera field of view, that the measured size of M57 and Saturn agree with published sizes.

So, that is about it for our first night of observing at the 60-inch telescope at MWO. It was fantastic just being in such a historic location and imagining all of the astronomical history made at such locations. As the telescope slewed to different targets it was fun seeing the dome move, along with its own almost tortured sounds of grinding and growling, and then also seeing the telescope move and slew to its next target. The MWO staff was very diligent about moving the stairs out of the way before moving the scope, of course a collision between the scope and the stairs would probably be a career ending event for the telescope operator.

Sky Safari Pro Screenshot of M57 with approximate 3 x 2 degree field of view. (Source: Palmia Observatory)


First attempt at Saturn in this 1/125 second DSLR image at MWO 60-inch telescope. (Source: Palmia Observatory)

Anyway, it was a lot of fun and we had plenty of energy to last most of the night, except Resident Astronomer Peggy and I gave up at midnight and had also wimped out and already reserved a hotel room in Pasadena. Even though I am not an astronomical eyepiece observer, relying mostly on my DSLR Liveview, it was neat to look through the eyepiece on this historic telescope. So, if you choose, and want to have your own experience, join an observing group and make your way to the mountain.

Until next time,

Resident Astronomer George

If you are interested in things astronomical or in astrophysics and cosmology, check out my blog at ***www.palmiaobservatory.com***

Orange County Astronomers has an online shop! The icon link to the shop can be found on the homepage of the OCA website. **Support OCA and BUY A TEE!** The direct link is:

http://www.neatoshop.com/artist/Orange-County-Astronomers

October Guest Speaker: Simona Murgia

The Brighter Side of Dark Matter.

Simona Murgia studies dark matter by searching for the debris produced by dark matter particles annihilating in space. As some of that debris might include gamma rays, she uses the data collected by Fermi LAT, a gamma-ray space based telescope, to search for this signal.

Evidence for dark matter is overwhelming. From experimental data, we can infer that dark matter constitutes most of the matter in the Universe and that it interacts very weakly, and at least gravitationally, with ordinary matter. However we do not know what it is. It is plausible that dark matter is made of a new kind of particle (or particles) and, as a result of this, it could shine at different wavelengths of light. I will discuss how we are sifting through observational data searching for this brighter side of dark matter to ultimately unveil its nature.

November Guest Speaker: George Becker

A Quick Tour Through Deep Space.

George Becker is an assistant professor in the UCR department of Physics and Astronomy. He received his PhD from Caltech, then did postdoctoral studies at the Carnegie Observatories and the University of Cambridge. He was an astronomer at the Space Telescope Science Institute before moving to UCR in 2015. His research focuses on the gas and dark matter in deep space, and how it connects to the formation of the first galaxies.

Most of the matter in the Universe resides not in galaxies, but in an intergalactic filamentary network known as the "Cosmic Web." The web includes both dark matter and ordinary (baryonic) matter, and it provides the raw materials for galaxy formation. Though the cosmic web is a critical component of the Universe, it is challenging to observe since it emits very little light of its own. I will describe how we study this material in deep space using the world's most powerful telescopes and computers, what we currently know about it, and its connection to both cosmology and galaxy formation.

Orion XX16g telescope, purchased new (Sept. 2016)

- Comes with shroud, gps, wheel kit, Telegizmo cover, 3 piece carrying case, power converter, telrad, 2 eyepieces. **$3,200.00**
- Celestron binoviewer, new (Oct. 2016) **$125.00**
- Denkmier binoviewer, older model but like new condition. **$400.00**

Contact Bill Johnson at 714-937-1980

A Trip Through the Milky Way

By Jane Houston Jones and Jessica Stoller-Conrad

Feeling like you missed out on planning a last vacation of summer? Don't worry—you can still take a late summertime road trip along the Milky Way!

The waning days of summer are upon us, and that means the Sun is setting earlier now. These earlier sunsets reveal a starry sky bisected by the Milky Way. Want to see this view of our home galaxy? Head out to your favorite dark sky getaway or to the darkest city park or urban open space you can find.

While you're out there waiting for a peek at the Milky Way, you'll also have a great view of the planets in our solar system. Keep an eye out right after sunset and you can catch a look at Venus. If you have binoculars or a telescope, you'll see Venus's phase change dramatically during September—from nearly half phase to a larger, thinner crescent.

Jupiter, Saturn and reddish Mars are next in the sky, as they continue their brilliant appearances this month. To see them, look southwest after sunset. If you're in a dark sky and you look above and below Saturn, you can't miss the summer Milky Way spanning the sky from southwest to northeast.

This illustration shows how the summer constellations trace a path across the Milky Way. To get the best views, head out to the darkest sky you can find. Credit: NASA/JPL-Caltech

You can also use the summer constellations to help you trace a path across the Milky Way. For example, there's Sagittarius, where stars and some brighter clumps appear as steam from a teapot. Then there is Aquila, where the Eagle's bright Star Altair combined with Cygnus's Deneb and Lyra's Vega mark what's called the "summer triangle." The familiar W-shaped constellation Cassiopeia completes the constellation trail through the summer Milky Way. Binoculars will reveal double stars, clusters and nebulae all along the Milky Way.

Between Sept. 12 and 20, watch the Moon pass from near Venus, above Jupiter, to the left of Saturn and finally above Mars!

This month, both Neptune and brighter Uranus can also be spotted with some help from a telescope. To see them, look in the southeastern sky at 1 a.m. or later. If you stay awake, you can also find Mercury just above Earth's eastern horizon shortly before sunrise. Use the Moon as a guide on Sept. 7 and 8.

Although there are no major meteor showers in September, cometary dust appears in another late summer sight, the morning zodiacal light. Zodiacal light looks like a cone of soft light in the night sky. It is produced when sunlight is scattered by dust in our solar system. Try looking for it in the east right before sunrise on the moonless mornings of Sept. 8 through Sept 23.

You can catch up on all of NASA's current—and future—missions at: ***www.nasa.gov.***

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