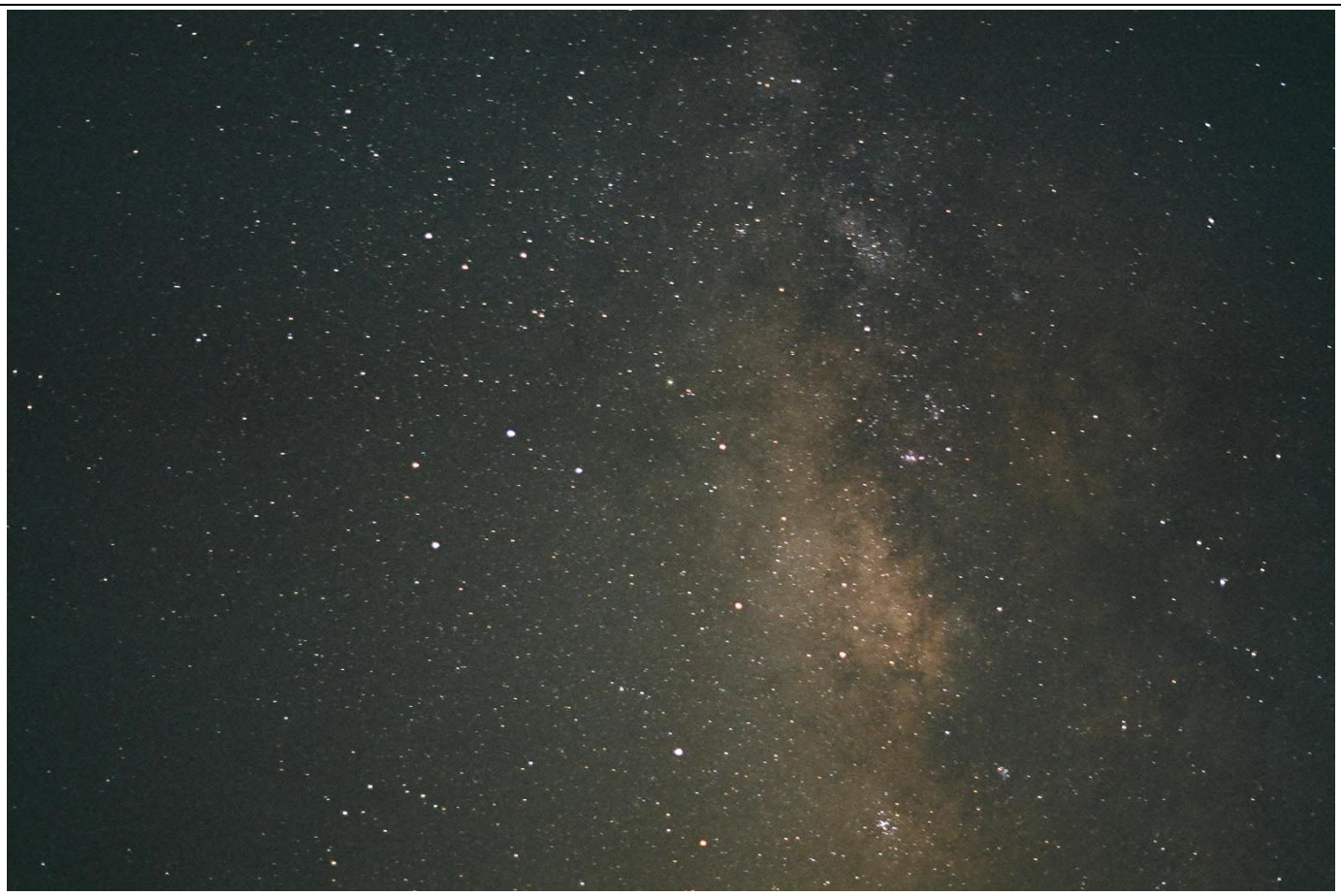
SIRIUS ASTRONOMER

www.ocastronomers.org

The Newsletter of the Orange County Astronomers

April 2017 *Free to members, subscriptions $12 for 12 issues* **Volume 44, Number 4**



As the winter constellations set earlier and earlier in the west, we are greeted by the summer constellations. One of the most familiar and spectacular is Sagittarius, easily recognized by the teapot asterism formed by its brightest stars. Containing the core of the Milky Way Galaxy, Sagittarius is home to a number of deep-sky objects. This picture was taken by Tim Hunt from our Anza site using a Minolta X570 SLR at f/1.7 and 30 seconds exposure.

OCA CLUB MEETING

The free and open club meeting will be held April 14 at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. This month, Dr. Laura Sales of UC Riverside will discuss the formation of galaxies in our universe.

NEXT MEETINGS: May 12, June 9 (speakers TBA)

STAR PARTIES

The Black Star Canyon site will open on April 22. The Anza site will be open on April 22. 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 April 7 and May 5.

Youth SIG: contact Doug Millar
Astro-Imagers SIG: Apr. 11, May 9
Astrophysics SIG: Apr. 21, May 19
Dark Sky Group: contact Barbara Toy

President's Message

By Barbara Toy

Spring at Anza:

Our Anza site, along with the rest of California, got more than its usual allotment of winter rain this year, so we have a bumper crop of weeds growing on the site. While the rains have given us more wildflowers than in recent years, the grasses are growing thick and strong, and the mustard, which generally comes a bit later than the grasses and becomes tough and woody as it matures, is already sprouting in many areas on our site as I write this. All of this is fuel for fire, and also can harbor critters that we want to avoid – more about the critters later.

Several years ago, we had a wildfire burn across the top part of our site and down as far as Mars Hill. Fortunately, thanks to the efforts of the local fire fighters, we didn't lose any structures, but we did have damage to benches and power outlets for some of the pads. The pattern we saw after the fire was that fire damage occurred in areas that hadn't been cleared of weeds, particularly where weeds and grasses were growing up to the edge of the pad. Because of all of the growth of flammable grasses and shrubs in the areas surrounding our site as well as on it, there is going to be a particularly high risk of fire out there this year, so if you are a pad or observatory holder at Anza, it is particularly important to clear a safety zone around your pad or observatory, and the earlier in the season you do it the better.

For those who don't themselves have a pad license but use other member pads because the pad holder is generally not out there – please show your appreciation for being able to use them by clearing the area around them if the pad holders haven't done it yet. For people who use the Football Field and/or Anza House, please help clear the weeds in those areas so they will be defensible in case of fire.

Because of the particularly high fire risk this year, we may pay someone to do the clearing of weeds in common areas on the site, but weeds will be an ongoing problem this year and one clearance alone won't take care of it. If you're going out to Anza, take along some tools, such as clippers, maybe a weed whacker if you have one that's reasonably portable, gloves, some bags to haul away what's cleared, and do some clearance work while you're waiting for sunset. The Anza site and your fellow club members will thank you!

Critters:

The reason we have reasonably dark skies at our Anza site is that it is in a rural area, but this also means that our site features all of the wildlife common to rural areas. Things like birds and bats enhance the experience out there, but we also have mice, rats, rattlesnakes, scorpions, black widow spiders and coyotes (and probably some big cats, too, periodically, but they're much harder to spot and seem to avoid people – as do the coyotes). So far, we haven't had any injuries from any of these, and we'd like that to continue. Keeping a weather eye out and taking reasonable precautions is generally enough to avoid problems.

As the area is warming, rattlesnakes are hatching, and these babies can actually be more dangerous than adults as they don't know how to regulate how much poison they inject yet so they tend to put all they have into any bite. Size is therefore not necessarily a good gauge of danger level. To minimize the chance you'll have a problem with any snake, it's best to stick to main routes on the site, particularly after dark, don't be shy about making noise to let them know you're coming, and also use enough light to see ahead of where you're walking so you can see anything that hasn't gotten out of your way and stay out of striking distance. The only snake bite we know of on site was to a large puppy who put his muzzle right on a baby rattlesnake while investigating it in the brush – if you bring your dog with you to the site, please keep him/her on a leash and out of the brush to minimize the chance of problems.

I've never seen a scorpion at Anza myself, but I'm told by folks who were out there in the early days that they used to be a significant problem, particularly if one decided to take refuge in a sleeping bag or shoe that was left out in the open. To minimize problems with them and any other critter that might be looking for a home, we recommend that you don't leave shoes, clothes or sleeping bags out in the open. If you use a tent while at Anza, it's a good idea to keep it zipped closed to avoid anything moving in with you.

If you go into a shed or other area at Anza that hasn't been opened for a while, you should check for black widow spiders, which are very common in that area (and also in Orange County, for that matter). Even if you can't get a good look at the abdomen to see if it has an hourglass mark on it, if you see a shiny black spider in an untidy web in an area that hasn't been disturbed for a while, it's quite likely to be a black widow and should be dispatched accordingly.

The biggest problem I've heard of from rats and mice is that they like to chew things, particularly computer cables and wiring or hoses in cars or other vehicles. We've lost several cables to rodent damage in the club observatory, and I've heard reports of cars that wouldn't start after rodents did some chewing around the engine. People have taken different approaches to minimizing problems with them, including leaving the hood of the car open so the engine cools faster, as engine warmth may attract them, and setting traps by the wheels of the car and keeping the car away from anything that will help a rodent climb up into the engine area. This seems to be less of an issue in the busier areas on the site, particularly if the weeds have been cleared so where vehicles are parked is very open – added incentive for some weed clearance….

To put all this in perspective, I've been going out to Anza for about 15 years, and often have wandered around portions of the site after dark as well as during the day. I've never seen a live snake on site myself (though I've been shown some dead ones), never had rodent damage to my car, and never really had a problem with any other critters, though I have had to deal with a few black widows over the years and have crossed paths with a couple of coyotes at different times – both of which looked very surprised to see me, as most people had left the site at the time, and both of which went on about their business without giving me more than a glance. If you stay aware of possible dangers and are reasonably careful, our wildlife neighbors shouldn't give you any significant problems.

Changes with Our Editor, Steve Condrey:

When I wrote about Steve Condrey in the last President's Message, I didn't know that he was likely to be having a major change in his life – specifically, a transfer out of state. If this goes through (as I write this, there is still some uncertainty about it), he and his family would be leaving California around June. The positive side of this for them is that they would be moving closer to family which,

for family-oriented people like Steve and Sandy, is an important consideration. The downside for us, of course, is that we will be losing them, which is a great loss, indeed.

Steve gave us advance notice of this to give us time to find a new editor for the Sirius Astronomer, so he could work with that person to make the transition as smooth as possible before he leaves. Essentially, the editor gathers the articles, pictures, etc., for each issue (and sometimes solicits things to be included), works out the appropriate layout using a publishing program that Steve would be passing on to the new editor, and then sends it off to the publisher electronically and also sends it to our webmaster, Reza AmirArjomand, to be posted on the website. When the newsletter is printed, those copies go to Charlie Oostdyk, who handles mailing them out to the members, so the editor doesn't have to worry about that.

If you have any questions about what might be involved or are interested in volunteering for this position, please Steve Condrey (startraveler68@yahoo.com) or me (btoy@cox.net).

It will be a sad day for us when Steve and his family leave, though I hope they will stay in touch. In the meantime, if you've been thinking you really should let Steve know how much his hard work on the Sirius Astronomer is appreciated – time is short, so do let him know without delay!

Some Parting Thoughts:

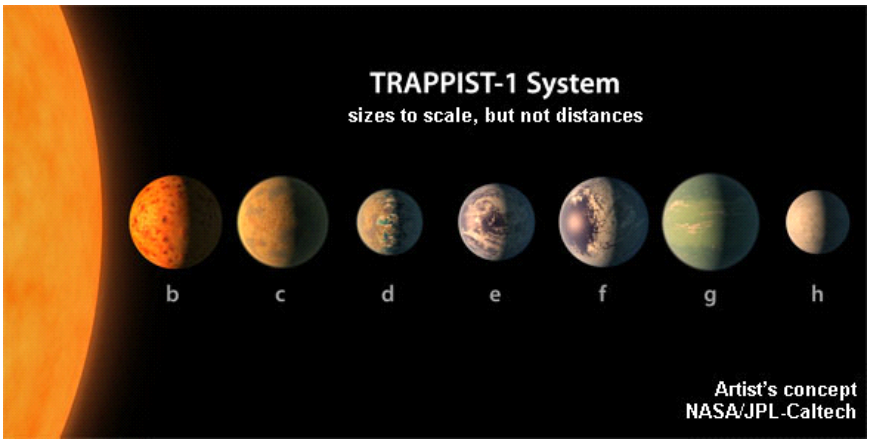
As I write this, the Messier Marathon is coming up, as it's scheduled for the March Anza star party. If you did the Marathon and haven't done so yet, please turn your sheet of sightings in to Alan Smallbone, Charlie Oostdyk or me, or send it to the club's PO Box, so we can provide you with your 2017 Messier Marathon Certificate. I say that with a certain sense of guilt, as I recently found a form turned in last year by Martin Christensen (who I think was the only one who decided to try it last year – as I recall, the sky conditions weren't very good during the 2016 Messier Marathon season, but it looks like he still managed to get 66 objects). Unfortunately, I don't have any record that we gave him his certificate for the 2016 Messier Marathon, in spite of his diligence. My apologies, Martin, and we'll make sure we print that for 2016 when we do the certificates for 2017.

The period around the time of the Messier Marathon each year is also a great time at Anza for watching Omega Centauri rising over the hills to the south of our site, ultimately becoming lost in the light dome to the west of those hills. It should still be visible in April – if you haven't seen it yet, it's well worth checking out, even though it never rises very far above our southern horizon. In binoculars it's a distinct fuzzy ball of stars that looks bigger and denser than other globular clusters, and in a telescope you can see individual stars surrounding a great, glowing core. It's a beautiful object, a southern hemisphere object that we can only see for a couple of months each year, so I hope you'll take advantage of it – if the skies clear up enough on dark sky weekends to let us do any viewing, that is!

AstroSpace Update

April 2017

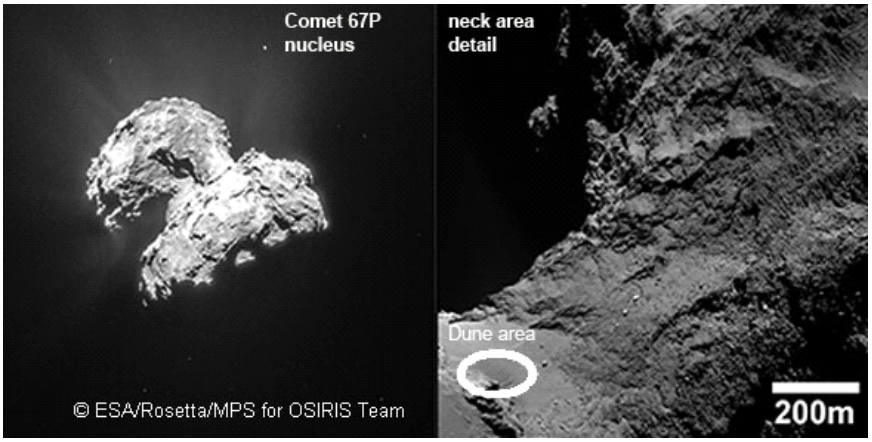
Gathered by Don Lynn from NASA and other sources



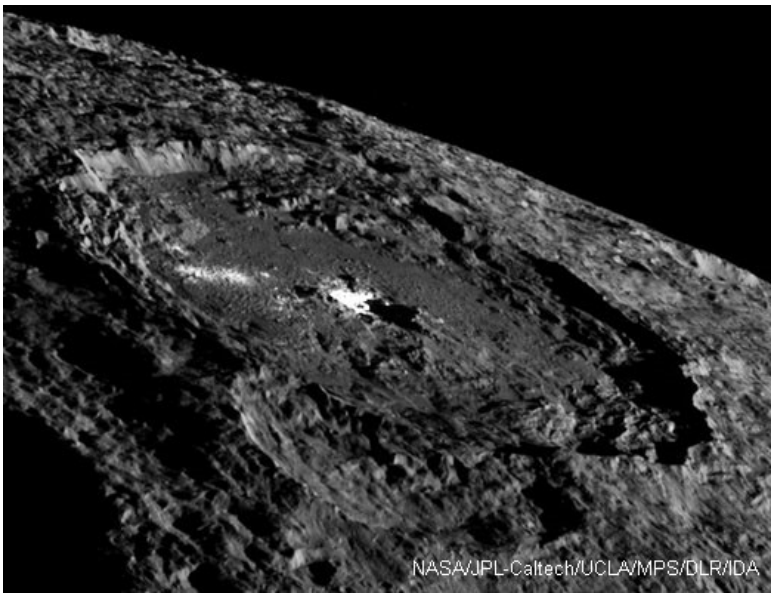
7-planet system – Spitzer (infrared space telescope), following up on discoveries by TRAPPIST (small exoplanet transiting telescope in Chile), has found 7 roughly Earth-sized planets orbiting a small dim red dwarf star. This is the most exoplanets known to orbit a single star. The star is being called TRAPPIST-1, and its planets TRAPPIST-1b, 1c, 1d, etc. 3 of the 7 orbit at such distances that their temperatures should support liquid water on their surfaces, that is, in the "habitable zone". With a few assumptions about more exotic atmospheres, they all could support liquid water. All are quite close to their star (closer than Mercury is to our Sun) – that's where the habitable zone is for a dim star. So a person on one of these planets would see the adjacent planets somewhat larger than our Moon appears from Earth. All those bright objects in the sky would make hunting dim galaxies difficult. Because they are so close to their star, they likely have become tidally locked, that is, always facing one particular side toward their star. Thus day and night would be places, not times. This could make one side too hot and the other side too cold for liquid water, depending on how winds distribute heat about the planet. The diameters, masses and densities of 6 of the planets have been measured, and all are likely to be rocky planets. Hubble Space Telescope is being used to try to observe any atmospheres on these planets. They cannot be imaged separately, but by comparing spectra before and during transits and occultations, the spectra of atmospheres can be squeezed out of the data. Results so far show only that 2 of the planets do not have large hydrogen atmospheres (such as gas giant planets have), and no result yet for the other 5. It is believed that the James Webb Space Telescope, to be launched next year, will do a more thorough job of finding atmospheres at these planets, as well as enable temperature measurements. Kepler (planet-finding space telescope) is also observing these 7 planets. Fortunately, they lie close to a planned Kepler observation area, and a tweak to the observing area included these planets. The system is in Aquarius, and relatively close, at 40 light-years distant. The age of TRAPPIST-1, and therefore the age of its planets, is uncertain due to conflicting observations: its spin says it's young, its quiet flare behavior says it is at least middle-aged, and its motion in space usually indicates old age. Calculations show that the current level of radiation from the star could strip atmospheres in billions of years, so it is not clear what atmospheres we might find, particularly on the inner planets. It is believed that the planets would have to have formed farther from their star, so they must have migrated in to their current orbits.

More possible exoplanets – Some evidence of exoplanets has been found (though no direct detection has been made) in a system with 2 stars, except they are only sort-of stars. One is a white dwarf, a dead star left when a star runs out of hydrogen fuel and shrinks to the size of the Earth. The other "star" is a brown dwarf, an almost star that never had enough mass to sustain fusion of hydrogen. The pair is known as SDSS 1557. The white dwarf appears to be eating rocky asteroids made mostly of metals, rather than ice. This implies rocky planets probably formed in the white dwarf's past. So it is likely that planets are there, but have so far been too difficult to detect.

Rosetta (comet mission) images show dune-like patterns on the surface of comet 67P, and the patterns moved over time. This comet should have almost no gravity and absolutely no atmosphere or wind. So how could dunes form and move? A new study shows that gas released as the comet warmed near the Sun creates enough wind to do this. The outgassing at most provides only 100,000 of the atmospheric pressure found on Earth. But with the extremely low gravity, this is enough. This comet nucleus has 2 lobes, often compared to the head and body of a rubber ducky. The dune-like patterns were found on the head, body and neck.



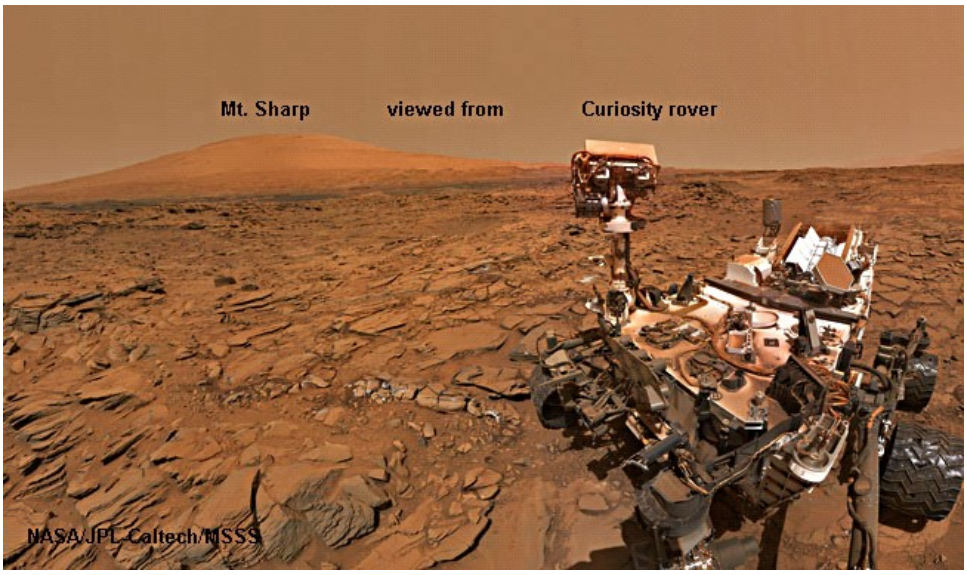
Asteroid pair is a term used for 2 asteroids that appear to have split apart from a single asteroid in the past. Another asteroid pair has been found, and tracing back their orbits, it appears they split about 6 years ago, making them the youngest known asteroid pair. Both fragments are active, displaying comet-like tails. The activity started when they neared the Sun in their orbits recently, not at the time of the split. They have been given a comet name (P/2016 J1), though their orbits appear to make them asteroids.



Dawn (asteroid mission) data indicates that the bright raised dome on Ceres is about 4 million years old, while Occator Crater in which it lies is about 30 million years older. The ages were determined by counting small impact craters that formed afterward. The dome appears to have been built up by multiple emissions of briny liquid that solidified into carbonate salts deposits. Scientists believe that the impact that created Occator Crater may have fractured the surface, which allowed the briny material from within to eventually reach the surface. Such cryovolcanic activity has been seen on other Solar System objects, but none this close to the Sun. Close-up images of Occator Crater show geological structures including fractures, avalanches, and small impact craters. The dome is about 2 miles (3 km) across, and 400 yards (400m) high. The brightest material on Ceres is on the dome, and has been identified as carbonate salts. A number of other scattered bright spots appear to be the same salts, but more mixed up with darker material so that they are not as bright. It is not clear if the activity that made the dome has ended. Some images seem to show a haze that may mean activity continues today.

More Dawn – The infrared spectrometer data shows organic (carbon compound) material in and around a crater called Enutet. Evidence was presented in a recent study that the materials were produced by processes on Ceres rather than being delivered by impacts. Organics have previously been found on other asteroids, and on some meteorites, which presumably came from asteroids.

Mars's northern polar cap consists of water ice with a seasonal coating of dry ice (frozen carbon dioxide). The region is covered with lines of pits about a yard (m) in diameter. New study of these pits indicates that faults or fractures below are opening up these lines of pits. Further observations are planned, as the appearance of the lines of pits seems to change with season.



Mars erosion – New studies of Gale Crater (where Curiosity is roving) show that wind erosion is adequate to explain how much of the sediment within the crater has disappeared, leaving the mountain (Mount Sharp, AKA Aeolis Mons) within the crater. At one time, perhaps 3 billion years ago, the whole crater had filled up with layers of sediment that sank in a lake that formed in the crater back when Mars had a thicker atmosphere and rain. The layers and lake evidence have been previously found by Curiosity. But there was debate over whether wind erosion could transform these layers into the layered mountain there today. The new study showed that after the lake dried up billions of years ago, the prevailing wind eroded away the layers, shaping the mountain we see. Then the mountain began shaping the prevailing wind.

Cassini (Saturn orbiter) – A recent study simulating the conditions found on Saturn's moon Titan shows that nitrogen found in the atmosphere there can dissolve in the hydrocarbon lakes. The nitrogen can fizz out in bubbles if the temperature or pressure changes slightly or the mix of ethane and methane changes. The study also showed that when an ethane lake freezes (from the bottom up, unlike water lakes) dissolved nitrogen fizzes out. Nitrogen bubbles creating fizzy patches could explain the mystery called "magic islands", patches that appear (in radar images taken by Cassini) like islands in the hydrocarbon lakes and seas, but they appear and disappear. On April 22, Cassini makes it final close flyby of Titan of its mission. The radar team has designed observations during this flyby to try to distinguish various theories of the magic islands: bubbles, waves, floating or suspended solids.

Sun's speed – A new study compared the speeds relative to the Sun of 200,000 nearby stars and found there is a gap where no stars exist at about 150 mi/s (240 km/s). The gap is where stars trying to orbit the Milky Way would fall in to the center. Thus it is a measure of the true speed with which the Sun orbits the Milky Way. Combining this with the proper motion of the center of the galaxy, as measured by Gaia (position-measuring space telescope) yields the distance to the center of the Milky Way (25,800 light-years). This method is not particularly more accurate than other ways to measure the Sun's speed and the galaxy center's distance, but when they repeat the calculation with more data expected soon from Gaia, it should be the most accurate.

Solar nebula age – Planets such as in our Solar System formed by condensing from a cloud of dust and gas around a new star. The cloud eventually dissipates, due to the light of the new star pushing the cloud. If it didn't, the drag from the cloud would eventually push the newly formed planets into the star. Just how long the cloud hangs around is the subject of much debate. A new study of an ancient angrite meteorite showed (using Uranium dating) that it formed 3.8 million years after the cloud of dust and gas formed, and the magnetic field that it trapped when it formed was quite weak. Previous work on another meteorite showed it formed 2-3 million years after the cloud formed, and it had a substantial magnetic field. Theorists had predicted that the magnetic field of the Solar System would have dropped at the time the cloud dissipated. So now we know the Solar System's formation cloud took no longer than 3.8 million years to dissipate.

Planet formation – Scientists have had trouble getting computer simulations to form planets. The simulations form gravel-sized stuff, then fail to grow to mile (km) sized objects. Starting with these larger objects, they can simulate growing to planets. A new simulation is getting through that middle stage. It shows that "dust traps" form in the cloud, which are high pressure areas where drift motion slows, allowing dust grains to conglomerate. The idea of a dust trap is not new, but the new simulation shows dust traps form easily and often.

ALMA (radiotelescope array) has detected a huge mass of dust in a galaxy so distant that the light left there when the Universe was only 4% of its current age. The mass of dust was estimated to be 6 million Sun's masses, while the stars in the galaxy itself constituted 2 billion Sun's masses. The observations also detected oxygen. Both the dust and oxygen detections are firsts for such a distant galaxy. The Universe started without dust or oxygen, and both are made and distributed about by stars, particularly exploding stars (supernovas). So finding these so early is telling us about early star formation and supernova occurrences in the early history of the Universe. Observing such a distant, and therefore dim, galaxy was made possible by the fact that it sits behind a massive galaxy cluster (Abell 2744) much closer that is magnifying its brightness through gravitational lensing.

Early small galaxies – Scientists used the Hubble Space Telescope to look through the same gravitational lens as the above ALMA observations, and another similar lens. A new technique has been developed to remove the foreground galaxies from images, revealing faint magnified very distant galaxies. It showed 167 faint galaxies with large redshifts that translate to their light traveling between 12.6 and 13.1 billion years to reach us. These galaxies emit less than 1% the light that our Milky Way does, some even 1/2000 of the Milky Way's light. They are precursors to dwarf galaxies like we see today. Astronomers now can estimate how many of these tiny galaxies existed, and how much light they emitted in this early time, and it was found to be consistent with how much light was required to reionize the Universe. Un-ionized gas absorbs ultraviolet light, but the ionized gas allows it to pass through. It is known that roughly this time period, ultraviolet light appeared because the Universe reionized (it had been ionized for 380,000 years after the Big Bang, so this is called RE-ionization). It has long been debated what the excitation source was for the reionization, so this new study supports small galaxies as a source.

Spitzer (infrared) Space Telescope has detected unusual pulsations in the outer shell of a star called HAT-P-2. The best guess is that its closely orbiting planet causes these vibrations each time it gets close to the star in its orbit. A similar effect has been seen caused by a companion star, but not a planet. This planet, known as HAT-P-2b, is about 8 times the mass of Jupiter, but still only 1% the mass of its star. Its orbit is eccentric, so it closely approaches its star every 5.6 Earth days. Spitzer watched as the planet went behind its star, and the pulsations continued, showing they indeed come from the star, not the planet.

Brightest neutron star – Most extremely bright X-ray sources in other galaxies are powered by material falling into a black hole. Now one of these has been shown to be a neutron star, not a black hole. It is located in galaxy NGC 5907 about 50 million light-years

away, and is the brightest neutron star (in X-rays) ever observed. So much material is falling in that it has spun up the neutron star from 1.43 seconds per revolution in 2003 to 1.13 seconds in 2014. To allow this object to be this bright, it must have an extremely strong multipolar magnetic field. It would be about the strength of the magnetic field in a magnetar (extremely magnetic type of neutron star), but with more magnetic poles.

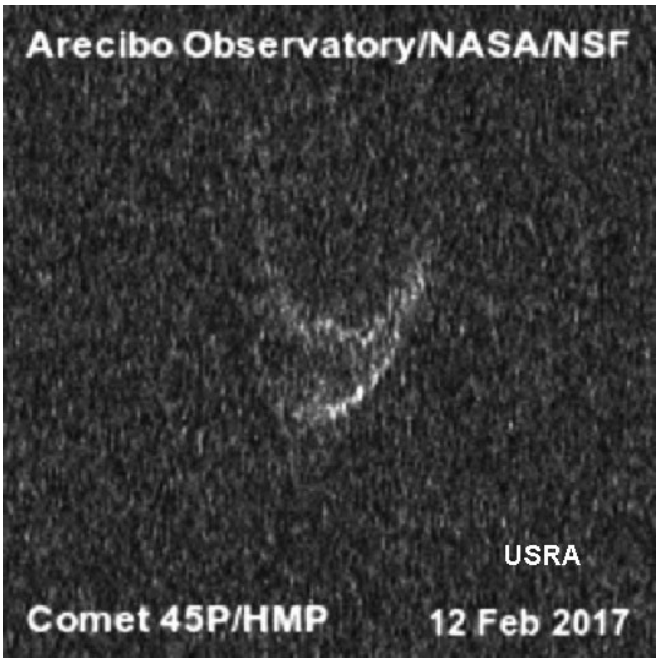
Rare variable star – Of the over 100 billion stars in our galaxy, about 400,000 are known to be variable, that is, their brightness changes. Of these, only 114 are HADS(B) variables, a type with a particular shape of asymmetric light curve. Some of these vibrate in 2 directions at once, and only 7 of them vibrate in 3 directions. So high school student Derek Hornung who just discovered the 7th one has to be pretty proud. The star is known as ROTSE1 J232056.45+345150.9 and lies about 7000 light-years away in Pegasus.

Black hole binary – An object known as X9 in the globular cluster 47 Tucanae was long thought to be a white dwarf gravitationally stealing material from a closely orbiting Sun-like star. But recent observations in X-rays and radio show it is quite likely a white dwarf closely orbiting a black hole, and that the material being pulled off is instead leaving the white dwarf on its way into the black hole. This is the only known binary of this type. The orbital period appears to be 28 minutes, which means they are orbiting at only 2.5 times the distance that our Moon orbits us. Massive objects orbiting this close should produce gravitational waves, but at too low of a frequency for LIGO to detect it. But future gravitational wave detectors might. Future plans include continuing observations of X9 and searches for similar objects in globular clusters.

Chandrayaan-1 (Indian lunar orbiter) went radio silent in August 2009. The mascons, or areas of dense material on the Moon, make satellites' orbits unpredictable. So no one knew where it was other than it had been in polar orbit. Using a new technique, scientists focused a powerful radio beam on the Moon's polar area from the Goldstone antenna in California, and listened for a radar return with the Green Bank antenna in West Virginia. 2 signals were seen just over 2 hours apart, the last known orbital period of Chandrayaan-1. Spacecraft found! The researchers also used the technique to radar track Lunar Reconnaissance Orbiter, though that was easier because it is currently operating, so its orbit is well known.

Dark matter theory – The favored theory of what makes up dark matter is subatomic particles known as Weakly Interacting Massive Particles (WIMPS). But last year's discovery of gravitational waves by LIGO found that the waves were created by merging of black holes of about 30 times the Sun's mass. This is larger than thought possible, assuming these black holes were formed by collapsing stars. This revived a previous theory about dark matter, that it is composed of primordial black holes, ones formed immediately after the Big Bang by the collapse of high density fluctuations. A new study shows that if dark matter is composed of primordial black holes ranging in mass roughly 10-100 solar masses, no observations of dark matter's effects yet made could distinguish this from dark matter made up of subatomic particles. But the black holes would have to be roughly that mass range; substantially more massive or less massive would contradict observations that have been made of dark matter effects. Other scientists have doubted that such black holes could exist and could have avoided detection. More observations (to find primordial black holes or WIMPS) are needed to settle this.

Instant AstroSpace Updates



NASA has set up a website called Backyard Worlds that invites the public to examine archived WISE (infrared space telescope) images to try to find the predicted **Planet Nine** and brown dwarf stars. A computer search of the WISE data did not find Planet Nine, but the computer is easily fooled by image defects.

NASA has narrowed down the possible landing sites for the **Mars 2020 rover** to 3 locations: Columbia Hills (near where Spirit roved), Jezero Crater, and Northeast Syrtis. Final selection will probably be next year.

Arecibo (radiotelescope in Puerto Rico) was able to radar image the nucleus of comet 45P/Honda-Mrkos-Pajdusakova near its close pass by Earth February 11.

In 2014 scientists proposed a liquid ocean below the frozen surface of Saturn's moon **Mimas** to explain a wobble in its orbit. A new study

shows that such an ocean should produce cracks in the surface, such as seen on Europa and other moons, but no such cracks were found on Mimas, so it probably does not have a liquid ocean.

Observations of a nearby **Seyfert galaxy** known as IRAS 13224-3809 show that it has a comparatively small supermassive black hole driving its unusually large and variable X-ray output and extremely massive outflow of material. More observations or theory are needed to explain how this occurs.

The Indian space agency (ISRO) has launched a **record number of satellites** on a single PSLV rocket: 104. All but one were tiny.

Russia's space agency announced that they are looking for 6-8 new young cosmonauts, expecting them to become the country's 1st on the **Moon**, planned for about 2031. Russia has 30 active cosmonauts, of which 14 have not yet been in space.

The spacecraft to launch in the early 2020s to flyby Jupiter's moon Europa 40-odd times has been officially named **Europa Clipper**. That name had been used as a nickname for the mission, but is now official.

Elon Musk, the head of SpaceX announced that he has promised to deliver a **flight around the Moon** and back, using a Falcon Heavy rocket and Dragon 2 spacecraft, to 2 unnamed rich persons who have put down substantial deposits. He predicts it will fly by the end of 2018, about when SpaceX begins delivery of astronauts to the space station with the same spacecraft on a smaller Falcon 9 rocket.

The announcements section of the meeting has been augmented by the participation of several of our young people from the club. They have been enjoying both being part of the meeting and having a responsibility in the club. There are half a dozen young people that participate in helping with the announcements depending on their school and extra curricular activities schedules. Here is a picture from a recent Meeting with Kyle, Bella, Sophia and Abby

What It's Like on a TRAPPIST-1 Planet

By Marcus Woo

With seven Earth-sized planets that could harbor liquid water on their rocky, solid surfaces, the TRAPPIST-1 planetary system might feel familiar. Yet the system, recently studied by NASA's Spitzer Space Telescope, is unmistakably alien: compact enough to fit inside Mercury's orbit, and surrounds an ultra-cool dwarf star—not much bigger than Jupiter and much cooler than the sun.

If you stood on one of these worlds, the sky overhead would look quite different from our own. Depending on which planet you're on, the star would appear several times bigger than the sun. You would feel its warmth, but because it shines stronger in the infrared, it would appear disproportionately dim.

This artist's concept allows us to imagine what it would be like to stand on the surface of the exoplanet TRAPPIST-1f, located in the TRAPPIST-1 system in the constellation Aquarius. Credit: NASA/JPL-Caltech/T. Pyle (IPAC)

"It would be a sort of an orangish-salmon color—basically close to the color of a low-wattage light bulb," says Robert Hurt, a visualization scientist for Caltech/IPAC, a NASA partner. Due to the lack of blue light from the star, the sky would be bathed in a pastel, orange hue.

But that's only if you're on the light side of the planet. Because the worlds are so close to their star, they're tidally locked so that the same side faces the star at all times, like how the Man on the Moon always watches Earth. If you're on the planet's dark side, you'd be enveloped in perpetual darkness—maybe a good thing if you're an avid stargazer.

If you're on some of the farther planets, though, the dark side might be too cold to survive. But on some of the inner planets, the dark side may be the only comfortable place, as the light side might be inhospitably hot.

On any of the middle planets, the light side would offer a dramatic view of the inner planets as crescents, appearing even bigger than the moon on closest approach. The planets only take a few days to orbit TRAPPIST-1, so from most planets, you can enjoy eclipses multiple times a week (they'd be more like transits, though, since they wouldn't cover the whole star).

Looking away from the star on the dark side, you would see the outer-most planets in their full illuminated glory. They would be so close—only a few times the Earth-moon distance—that you could see continents, clouds, and other surface features.

The constellations in the background would appear as if someone had bumped into them, jostling the stars—a perspective skewed by the 40-light-years between TRAPPIST-1 and Earth. Orion's belt is no longer aligned. One of his shoulders is lowered.

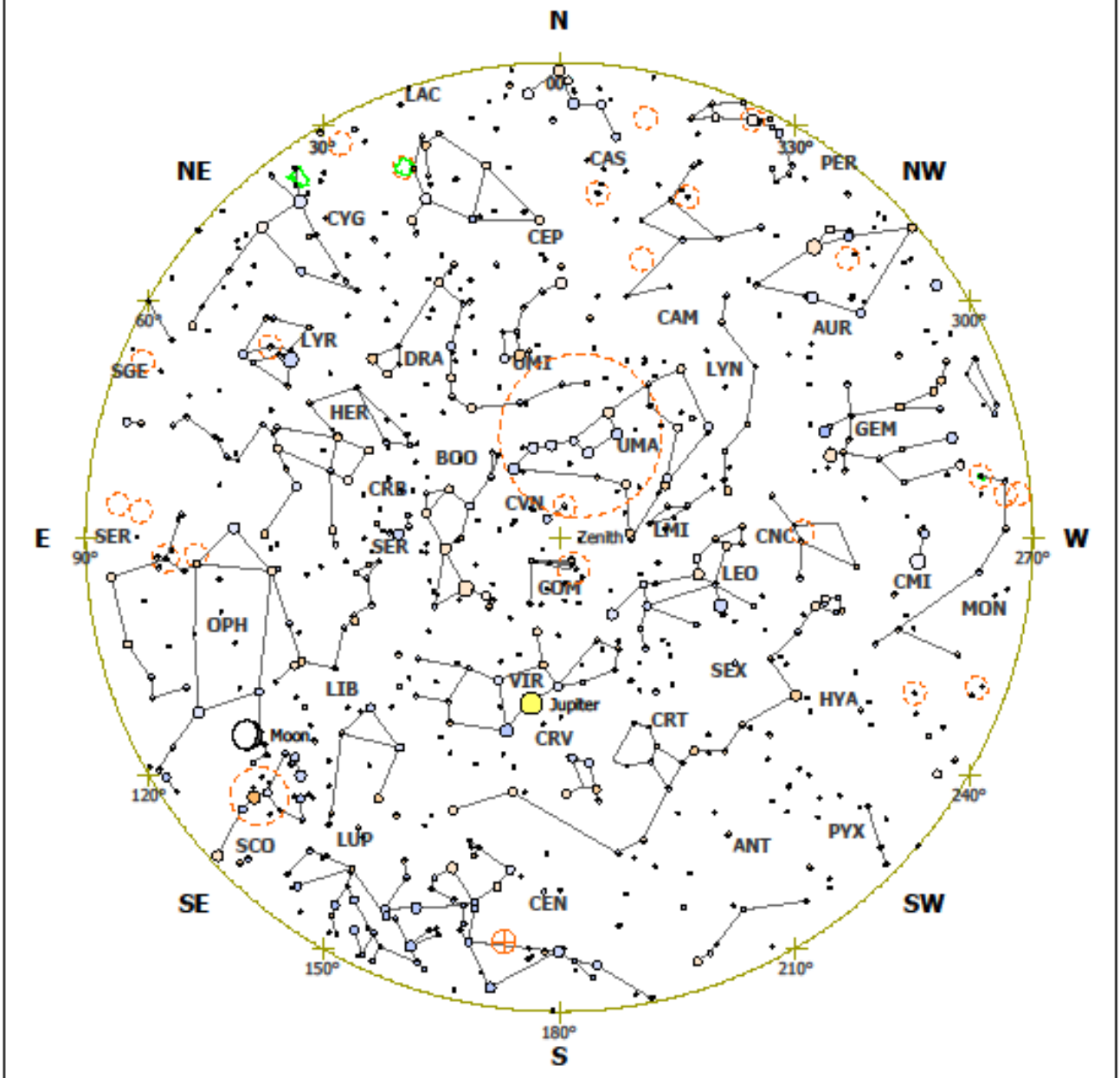
And, with the help of binoculars, you might even spot the sun as an inconspicuous yellow star: far, faint, but familiar.

Want to teach kids about exoplanets? Go to the NASA Space Place and see our video called, "Searching for other planets like ours": https://spaceplace.nasa.gov/exoplanet-snap/

This article is provided by NASA Space Place.

With articles, activities, crafts, games, and lesson plans, NASA Space Place encourages everyone to get excited about science and technology. Visit spaceplace.nasa.gov to explore space and Earth science!

April 2017 Whole Sky Chart



Symbols

Galaxy	Bright nebula	Antisolar point
Quasar	Dark nebula	Asteroid
Globular cluster	Planetary nebula	Comet
Open cluster	Supernova remnant	Meteor shower

Magnitudes and temperatures (× 1000 K)

-6	-5	-4	-3	-2	-1	0	1	2	3	4	5
40	25	20	15	10	8	7	6	5	4	3	2

Location

United States, CA, Long Beach
Lon: 118° 11′ 18″ W, Lat: 33° 46′ 01″ N
Time zone: GMT-08:00
Elevation: 29 feet above sea level

Time

Local time: 2017-04-15 00:00:00
Universal time: 2017-04-15 07:00:00
Julian date: 2457858.79167
Sidereal time: 12h 41m 46s

View

Field of view: 200° 00′ 00″
RA: 12h 41m 46.07s, Dec: +33° 46′ 01.0″
Azi: 180° 00′ 00.0″, Alt: +90° 00′ 00.0″
Constellation: Canes Venatici

SIRIUS ASTRONOMER
www.ocastronomers.org
The Newsletter of the Orange County Astronomers

Nonprofit Organization
U.S. Postage
PAID
Santa Ana, CA
Permit No. 1468

NEWSLETTER OF THE
ORANGE COUNTY ASTRONOMERS
P.O. BOX 1762
COSTA MESA, CA 92628

RETURN SERVICE REQUESTED

DATED MATERIAL
DELIVER PROMPTLY

HANDY CONTACT LIST

CLUB OFFICERS (to contact the entire board at once, send an email to board@ocastronomers.org)

President	Barbara Toy	btoy@cox.net	714-606-1825
Vice-President	Reza AmirArjomand	reza@ocastronomers.org	646-494-9570
Treasurer	Charlie Oostdyk	charlie@cccd.edu	714-751-5381
Secretary	Alan Smallbone	asmallbone@earthlink.net	818-237-6293
Trustee	Andy David	andy@ocastronomers.org	410-615-2210
Trustee	Kyle Coker	kcoker@cox.net	949-643-9116
Trustee	Doug Millar	drzarkof56@yahoo.com	562-810-3989
Trustee	Sam Saeed	sam@isismagna.com	714-310-5001
Trustee	Greg Schedcik	gregsched@verizon.net	714-322-5202
Trustee	Gary Schones	gary378@pacbell.net	951-687-7905
Trustee	Amir Soheili	amirsoheili@yahoo.com	714-276-7766

COMMITTEES, SUBGROUPS, AND OTHER CLUB VOLUNTEERS

Anza House Coordinator	Doug Acrea	dougcarola@att.net	949-770-2373
Anza Site Maintenance	Don Lynn	donald.lynn@alumni.usc.edu	714-775-7238
Beginner's Astronomy Class	David Pearson	p.davidw@yahoo.com	949-492-5342
Black Star Canyon Star Parties	Steve Mizera	mizeras@cox.net	714-649-0602
Explore the Stars OCA Contact	Bob Nanz	bob@nanzscience.com	760-751-3992
Librarian	Karen Schnabel	karen@schnabel.net	949-887-9517
Membership, Pad Coordinator	Charlie Oostdyk	charlie@cccd.edu	714-751-5381
Mt. Wilson Trips	Michele Dadighat	mmpkb8@gmail.com	573-569-3304
Observatory Custodian/ Trainer/Member Liaison	Barbara Toy	btoy@cox.net	714-606-1825
OCA Outreach Coordinator	Adriane (Andy) David	outreach@ocastronomers.org	410-615-2210
Sirius Astronomer Editor	Steve Condrey	startraveler68@yahoo.com	714-699-1243
Telescope Loaner Program	Sandy and Scott Graham	Sandy2Scott@sbcglobal.net	714-282-5661
WAA Representative	Tim Hogle	TimHogle@aol.com	626-357-7770
Webmaster	Reza AmirArjomand	reza@ocastronomers.org	646-494-9570

SPECIAL INTEREST GROUPS (SIG's)

AstroImagers SIG	Alan Smallbone	asmallbone@earthlink.net	818-237-6293
Astrophysics SIG	Bob Sharshan	RSharshan@aol.com	714-845-6573
Dark Sky SIG	Barbara Toy	btoy@cox.net	714-606-1825
Youth SIG	Doug Millar	drzarkof56@yahoo.com	562-810-3989

OCA WEBSITE: http://www.ocastronomers.org STARLINE 24-HR. Recording: 714-751-6867 ANZA OBSERVATORY: 951-763-5152