



The Cat's Paw Nebula, NGC 6334, is a prolific stellar nursery located approximately 5500 light-years away in the constellation Scorpius. OCA member Rick Hull created this image on July 7 from our Anza observing site, using an SV 110ED at f/7 and a QSI 6120C imager. 8 11-minute exposures were stacked to create this image.

OCA CLUB MEETING

The free and open club meeting will be held August 12 at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. This month's speaker is Tim Thompson of the Mt. Wilson Institute, who will attempt to tell us How Big Is The Universe?.

NEXT MEETINGS: Sept. 9, Oct. 14

STAR PARTIES

The Black Star Canyon site will open on August 27. The Anza site will be open on September 3. 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 session of the Beginners Class will be held at the Heritage Museum of Orange County at 3101 West Harvard Street in Santa Ana on August 5. The following class will be held September 2.

NEW! Teenage SIG: contact Doug Millar

Astro-Imagers SIG: Aug. 9, Sept. 13

Remote Telescopes: contact Delmar Christiansen

Astrophysics SIG: Aug. 19, Sept. 16

Dark Sky Group: contact Barbara Toy



Venus and Jupiter prepare for their close-up this August

By Ethan Siegel

As Earth speeds along in its annual journey around the Sun, it consistently overtakes the slower-orbiting outer planets, while the inner worlds catch up to and pass Earth periodically. Sometime after an outer world—particularly a slow-moving gas giant—gets passed by Earth, it appears to migrate closer and closer to the Sun, eventually appearing to slip behind it from our perspective. If you've been watching Jupiter this year, it's been doing exactly that, moving consistently from east to west and closer to the Sun ever since May 9th.

On the other hand, the inner worlds pass by Earth. They speed away from us, then slip behind the Sun from west to east, re-emerging in Earth's evening skies to the east of the Sun. Of all the planets visible from Earth, the two brightest are Venus and Jupiter, which experience a conjunction from our perspective only about once per year. Normally, Venus and Jupiter will appear separated by approximately 0.5° to 3° at closest approach. This is due to the fact that the Solar System's planets don't all orbit in the same perfect, two-dimensional plane.

But this summer, as Venus emerges from behind the Sun and begins catching up to Earth, Jupiter falls back toward the Sun, from Earth's perspective, at the same time. On August 27th, all three planets—Earth, Venus and Jupiter—will make nearly a perfectly straight line. As a result, Venus and Jupiter, at 9:48 PM Universal time, will appear separated by only 4 arc-minutes, the closest conjunction of naked eye planets since the Venus/Saturn conjunction in 2006. Seen right next to one another, it's startling how much brighter Venus appears than Jupiter; at magnitude -3.80 , Venus appears some *eight times brighter* than Jupiter, which is at magnitude -1.53 .

Look to the western skies immediately after sunset on August 27th, and the two brightest planets of all—brighter than all the stars—will make a dazzling duo in the twilight sky. As soon as the sun is below the horizon, the pair will be about two fists (at arm's length) to the left of the sun's disappearance and about one fist above a flat horizon. You may need binoculars to find them initially and to separate them. Through a telescope, a large, gibbous Venus will appear no more distant from Jupiter than Callisto, its farthest Galilean satellite.

As a bonus, Mercury is nearby as well. At just 5° below and left of the Venus/Jupiter pair, Mercury achieved a distant conjunction with Venus less than 24 hours prior. In 2065, Venus will actually occult Jupiter, passing in front of the planet's disk. Until then, the only comparably close conjunctions between these two worlds occur in 2039 and 2056, meaning this one is worth some special effort—including traveling to get clear skies and a good horizon—to see!

To teach kids more about Venus and Jupiter, visit the NASA Space Place webpages titled "All About Venus" [<http://spaceplace.nasa.gov/all-about-venus/en/>] and "All About Jupiter" [<http://spaceplace.nasa.gov/all-about-jupiter/en/>].

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!

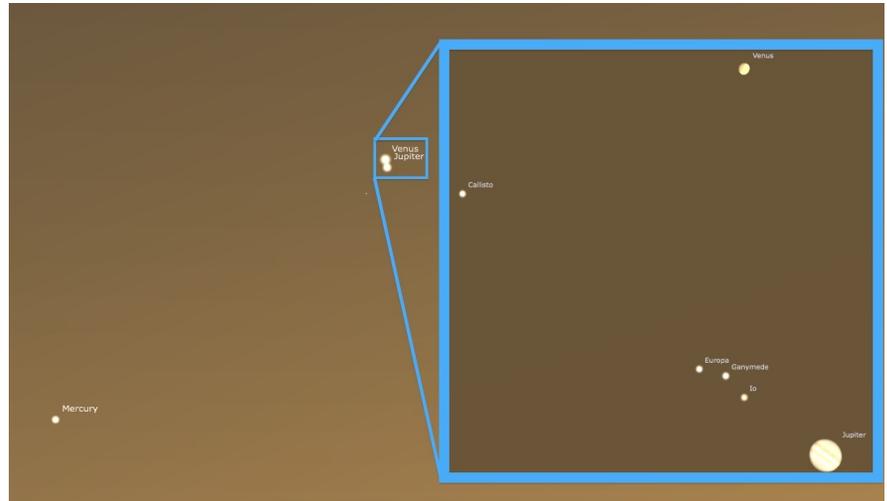


Image credit: E. Siegel, created with Stellarium, of a small section of the western skies as they will appear this August 27th just after sunset from the United States, with Venus and Jupiter separated by less than 6 arc-minutes as shown. Inset shows Venus and Jupiter as they'll appear through a very good amateur telescope, in the same field of view.

AstroSpace Update

August 2016

Gathered by Don Lynn from NASA and other sources

Another gravitational wave – As expected, the 1st discovered gravitational wave, noted here in March, was not the last one. LIGO (pair of gravitational wave detectors) scientists announced another discovery, and probably a 3rd. The latter was such a weak signal that they aren't claiming a full 3rd discovery. The 2nd was caused by 2 colliding black holes (as was 1st), but smaller masses than 1st (14 & 8 solar masses). The collision had to be 1.5 billion light-years away to cause the strength of wave seen. LIGO is offline now while improvements are made to its sensitivity. It will be fired up in the fall and should detect gravitational waves even more often. Also by then, the Italian gravitational wave detector, named Virgo, should be operational. Having 3 detectors will better pinpoint the sources of such waves.



Juno arrived at Jupiter on July 4, fired its engine for 35 minutes, and went into orbit about the giant planet. It is an unusual orbit in that it is quite eccentric, in order to skim close to the planet, under the dangerous radiation belts, at perijove (low point in orbit), then escape through the weak radiation zones over the poles. The mission plans 37 orbits, after which precession of the orbit is expected to push it into the thick of the radiation belts. Even with its titanium vault to protect sensitive spacecraft parts from radiation, it is expected that venturing into the radiation belts would knock the spacecraft out of operation, except that before that happens, the mission will end and intentionally plunge into Jupiter in February 2018. If the spacecraft were allowed to coast in orbit after the mission is completed (rather than plunging into the planet), there is a chance that it would strike one of the moons

and contaminate it with microbes that survived sterilization of Juno before launch. The observations made very close to the planet (about 2700 miles [4300 km] above the clouds tops) will allow measuring tidal forces so precisely that scientists can determine the makeup of the interior of Jupiter. Other goals of Juno are to study Jupiter's atmosphere (particularly water content), weather patterns, and magnetic and plasma properties, including aurora. All but the 1st few orbits will take 14 days each. No observations were taken at the time of going into orbit, in order to protect the instruments from radiation and other dangers. The 1st close-up observations will take place around August 25, at the next perijove. Juno has huge and efficient solar panels, which allows it to be the 1st spacecraft to ever operate on solar power at Jupiter. The giant planet is so far from the Sun that there is only 1/27 of the solar power available at Earth. The only ordinary camera (visible light) aboard the spacecraft is the JunoCam, which will be used for public outreach and education. That is, the public can request what images to take. I'm guessing everyone will want the Red Spot. Juno has infrared instruments that can penetrate quite a few cloud layers, and allow us to see what is going on deeper in the atmosphere than ever before. The spacecraft was named after the Roman god Jupiter's wife Juno, who had the power to see through the clouds that Jupiter used to hide himself. The spacecraft carries a plaque commemorating Galileo discovering Jupiter's 4 large moons, and 3 Lego toy figures representing Galileo and the gods Jupiter and Juno. They are made of aluminum rather than plastic to withstand space travel.

A dwarf planet has been discovered beyond Neptune, and has been dubbed 2015 RR245. From its brightness it is estimated to be 440 miles (700 km) in diameter, which is easily sufficient to be classed as a dwarf planet. It takes about 700 years to orbit the Sun, and has a highly elliptical orbit. It was found by the OSSOS survey, which is designed to quantify how objects orbit in the outer Solar System. The survey has found over 500 objects beyond Neptune, but this is the 1st large enough to be a dwarf planet.

Largest known exoplanet (about the mass of Jupiter) that orbits 2 stars, dubbed Kepler-1647b, has been discovered. It also has the longest orbit (3 Earth years) of any known planet orbiting 2 stars. Its age is about 4.4 billion years and it is 3700 light-years away. It lies in its star's habitable zone (the area where liquid water is possible on its surface), but would have no surface since it is a gas giant. It is possible that it has moons where liquid water could exist on their surfaces.

Youngest known exoplanet has been discovered, and has been dubbed K2-33b. It is very close to its star, so its year is only 5 Earth days. The planet is only 5-10 million years old. Planets form in protoplanetary disks of dust and gas, and then the disks dissipate. K2-33b's star has only a small amount of disk left, so the planet is probably fully formed. The planet is larger than Neptune, and

therefore a gas giant. Gas giants should form much farther from their stars, which probably indicates that migration of a planet to an orbit near a star can take place very early in the life of a planet. The best theory for quick planet migration is that it is caused by drag from the protoplanetary disk. K2-33b is almost 500 light-years away in the Upper Scorpius star-forming region. Then in another announcement, a planet was found orbiting the variable star V830 Tauri, and that star is only 2 million years old. It is a hot Jupiter, that is, a gas giant quite close to its star. Migration from disk drag is further supported.

3-sun exoplanet has been discovered orbiting the brightest star of a triple star known as HD 131399. Its year is 550 Earth years, meaning it orbits at a very large distance. For about 3/4 of each year (over 400 Earth years) every day would have sunrises and sunsets of each of the 3 stars, and a night time. The other 1/4 would have no night, since 1 or more of the triple star would always be up. The system is about 16 million years old, and is about 320 light-years away in Centaurus. SPHERE, an adaptive optics system on the Very Large Telescope in Chile, has directly imaged the planet in infrared. The planet is a gas giant, whose mass is 4 times that of Jupiter, so observing all those sunsets would be difficult, with no solid surface to stand on. The planet is 1075°F (580° C). It is obviously not hot due to proximity to its stars, so has retained heat from its formation. Its orbit is by far the largest known in any multi-star system. The primary star is 80% more massive than the Sun, and the other 2 are smaller and orbit each other about 300 AU away (1 AU = Earth-Sun distance). Compared to other planets in multi-star systems, this planet is surprisingly far from its primary star and surprisingly close to the secondary stars.

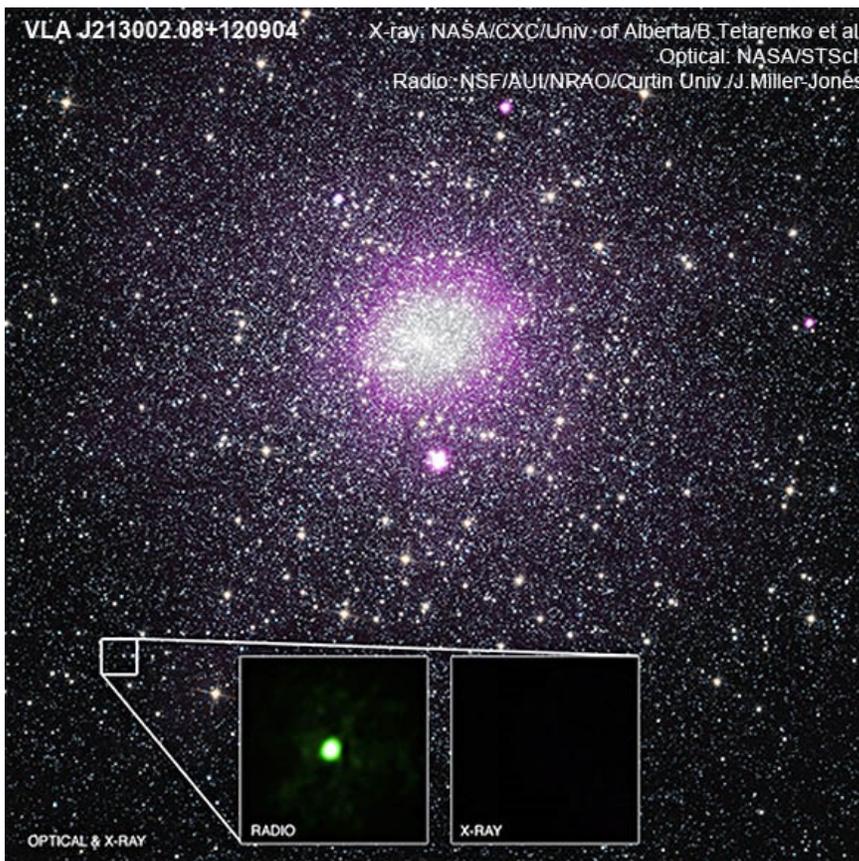
5 exoplanets have been found orbiting a star in Kepler (planet finding space telescope) data. They are 2 sub-Neptune-sized planets, 1 Neptune-sized, 1 sub-Saturn-sized and 1 Jupiter-sized. The star hosting these (HIP 41378) is 1.4 times the size and 1.15 times the mass of our Sun. The planets have fairly small orbits, and therefore short years. Since Kepler started operating with solar pressure substituting for 1 of its gyros (since too many gyros had failed), the spacecraft has been less stable in tracking the stars to sub-pixel accuracy. Scientists have written a computer program that adjusts the images to remove those instabilities, and it has worked quite well. Indications of the 5 planets were not readable until the program was applied.

Inclined exoplanets – 2 Saturn-mass planets have been found orbiting the star Kepler-108. Their orbits are highly inclined with respect to each other. Planetary systems should form with all planets in the same plane. This probably means that the planets collided or nearly did so to change their inclination.

Extreme distance exoplanet pair – 2 planets have been discovered orbiting the star CVSO 30 at extreme distances: 1 so close it takes only 11 hours per orbit, and the other 27,000 Earth years. The outer is more than 20 times the distance from its star as Neptune is from the Sun, while the inner is 48 times closer than Mercury is to the Sun. The leading theory is that a close encounter gravitationally flung the planets opposite directions. Both planets have 1-4 times the mass of Jupiter. CVSO 30 is a young star, only 2.5 million years old.

Sneaky black holes – An object seen in radio light known as VLA J213002.08+120904 was discovered about 20 years ago, but all the theories of what it might be seemed to have holes in them. A new study shows that it is a binary star in which 1 star is a black hole. This theory had previously been rejected because such binaries produce X-rays, and none were detected there. It apparently is not feeding on any substantial amounts of material falling into the black hole, so produces essentially no X-rays. It is the quietest known black hole binary other than some inside globular clusters. The object appears near globular M15, but has been shown to be much closer and not associated with the cluster. Since very little of the sky has been searched (in radio light) for similar objects, it is predicted that the rest of the sky holds lots of these sneaky black holes.

Splitting comets – A study of the nucleus of comet 67P/Churyomov-Gerasimenko (the one shaped like a rubber ducky) shows that if in the past it rotated in 7-9 hours (it currently does in 12 hours), then it would form cracks exactly like the ones imaged by the Rosetta spacecraft. The study scientists propose that it is common for comet nuclei to spin up due to jets shooting out as they heat near the



Sun, until the spinning cracks or splits the nuclei in 2. They should often later collide gently and form new shapes of nuclei. This is probably what formed the rubber ducky shape. Of the 7 comet nuclei that have been imaged close up, 5 of them appear to have 2 lobes, supporting this proposal.

Galaxy formation – A new computer simulation of galaxy formation, the 1st to model dark matter and regular matter in detail, showed few satellite dwarf galaxies forming around it. This better matches reality than previous galaxy formation simulations, which showed thousands of satellites forming. Only a few dozen are known around our own Milky Way, not thousands. It appears that supernovas and tidal forces break up most small clumps of matter before they collapse into dwarf galaxies.

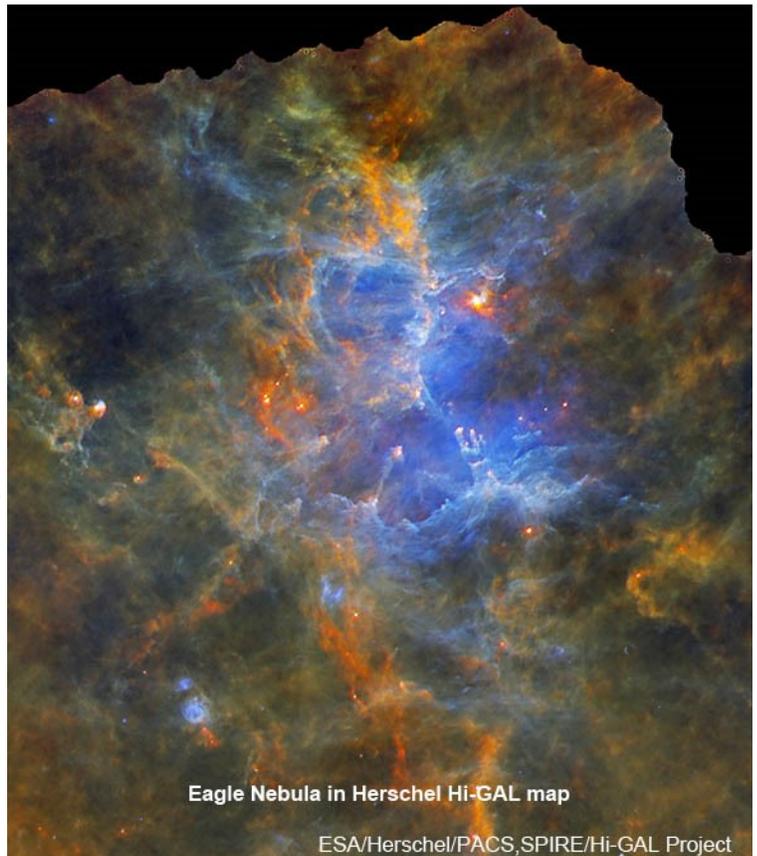
Dark Energy – The BOSS survey, being made with the Sloan Telescope in New Mexico, has announced the results of 10 years of observations: Dark energy is probably of the form of a cosmological constant, that is, where dark energy has constant density over time. BOSS produced a 3-dimensional map of a large part of the sky out to 6 billion light-years away. Analysis of the bunching of galaxies in all dimensions produced the announced constraint on how dark energy acts.

The Hayabusa spacecraft, designed to retrieve a sample from the surface of an asteroid in 2005, had its sample mechanism fail, so returned only microscopic bits that happened to strike the sample collector when the spacecraft touched down. Yet study of these tiny bits since the sample retrieval in 2010 keeps resulting in new findings. The latest is that examination of the specks with electron microscopes and X-ray microtomography show there are 4 different patterns on their surfaces. The 1st pattern is 4.5 billion years old and shows intense heat, which would only be possible inside a body larger than the asteroid sampled (named Itokawa). 2nd pattern shows a collision occurred about 1.3 billion years ago. 3rd shows exposure to solar wind between 1 million and 1000 years ago. 4th shows that particles rubbed against each other. The conclusion from this is that a larger asteroid formed along with the rest of the Solar System, and it later broke apart during a collision, and the present asteroid formed from some of the collision fragments. Since then, the surface gets jostled and subjected to solar wind. Asteroids often lead violent lives.

Centaur rings – Asteroids beyond Jupiter are known as Centaurs. A few of them have been found to have rings, like the gas giant planets, except smaller. Such rings are found when a Centaur passes in front of a star. It is known that Centaurs over many millions of years often pass close to a gas giant planet. It was thought that such close passes should destroy rings. But a new computer simulation of Centaur orbits shows that in spite of many close passes to giant planets, the Centaur rings mostly survive. The study team will next try to determine how rings form about Centaurs in the 1st place.

Dry Venus explained – Our sister planet Venus should have formed with about as much water as Earth, perhaps with oceans, yet it is very dry now. Even if the water was broken up into hydrogen and oxygen, the oxygen should still be there. Hydrogen, however, is easy to lose to space, so its absence on Venus is expected. But Venus has very little oxygen. New research shows that the electric field found in the Venusian atmosphere can propel oxygen ions up and out in what is being called an electric wind.

Herschel (infrared space telescope) teams have released 2 massive map/catalogs made from years of observations: ATLAS map of deep space, and Hi-GAL map of the center of our Milky Way. ATLAS contains about ½ million galaxies, many of which cannot be seen in other wavelengths, due to dust. ATLAS is actually 5 maps of the same area taken in 5 different wavelengths of far infrared. The most distant galaxies seen took light 12 billion years to get here, so the evolution of galaxies over 12 billion years can be seen in ATLAS. There is a steady reduction in dust; that is, dust is used up faster than it is being made. Scientists quipped that the Universe seems to be self-cleaning. Hi-GAL covers the largest area of any Herschel survey, at about 800 square degrees. It has 5 wavelengths covering from far infrared to submillimeter (marginally radio). More area of Hi-GAL will be released by the end of the year. Over 300,000 objects are cataloged in the most fertile wavelength.



1st chiral molecules found in interstellar space were discovered by the Green Bank radiotelescope observing a gas cloud called Sagittarius B2. They are molecules of propylene oxide. Chiral molecules are ones that are asymmetric such that they have a left and a right version of them. Chiral molecules are found everywhere on Earth, and are known to occur in comets and asteroids.

Missions extended – NASA has approved extended operation of 9 space missions, pretty much as expected: New Horizons toward trans-Neptune object 2014 MU69, Dawn orbiting Ceres, Lunar Reconnaissance Orbiter, the NASA part of the European Mars Express, and NASA Mars missions: MRO, MAVEN, Odyssey, Curiosity, Opportunity. New Horizons had already fired its engine to put it on a path toward arrival at MU69 on January 1, 2019, because orbital mechanics do not wait for budget decisions. It is interesting that MU69 had not been discovered when New Horizons was launched. There was a proposal to move Dawn on to a 3rd asteroid (it has already studied Vesta and Ceres), but NASA decided that there is more science value in continued study of Ceres. So Dawn will remain in its LAMO (Low Altitude Mapping Orbit) about Ceres until it runs out of fuel. In fact, it will remain there long after running out, but controllers will no longer be able to command it to make observations.

Space radiotelescope – Dutch researchers are developing a radiotelescope to be carried to the lunar L2 Lagrange point on a Chinese spacecraft. It will receive lower frequency radio than penetrates our atmosphere, and will be shielded from Earthly noise by being behind the Moon. It is expected to discover much about the early Universe, and also monitor space weather, that is, activity from the Sun, and radio emissions from the planets. It is planned to make the 1st map of the entire sky at low radio frequencies.

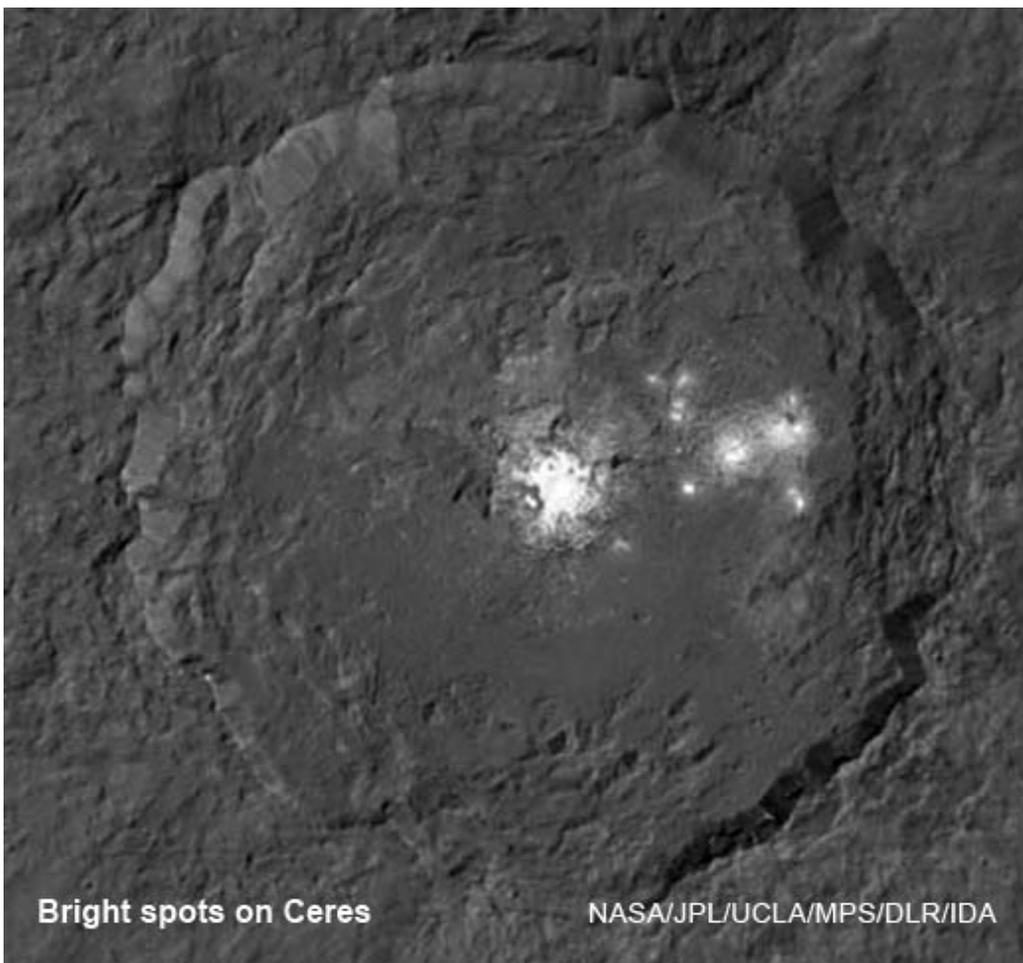
Instant AstroSpace Updates

It was previously announced that the bright **spots on Ceres** are some kind of salt, likely magnesium sulfate. More infrared spectral data show that the bright salty spots are sodium carbonate, with some ammonia mixed in, raising the question: how did sodium carbonate form there?

Mars rover Curiosity has found a deposit of manganese dioxide, which requires water and oxidizing conditions to form. This implies there was likely a substantial level of **oxygen** in the **Martian atmosphere** when the deposit formed, probably billions of years ago.

A new study has explained how the 2 **Van Allen radiation belts** around the Earth split into 3 belts for a few weeks in 2013. Intense ultra-low frequency plasma waves during an outburst from the Sun move the outer part of the 2 belts higher into a 3rd belt.

Construction has just completed in China of the 500-meter diameter **radiotelescope**, named FAST, larger than the Arecibo dish, which has been the largest for 53 years. Operations are expected to begin in September. Controversy exists over relocating 9000 people to make room for FAST.



SCAE OPT – June 18, 2016



This year OPT (Oceanside Photo & Telescope) held another big Southern California Astronomy Exposition in the parking lot of their store on Mission Street in Oceanside. It was a one-day event with lots of vendors and great sales along with some nice free give-away prizes.



Solar scopes were set up and people were amazed at the views of the Sun right from the parking lot. They had hundreds of people pass through and OPT generously provided OCA with a free booth & food. We were the only Astronomy club with a booth again this year which Steve & Bonnie Short set up and ran from 12:30 -5:30 pm. Next year we would like to see more OCA members volunteer to sit at the booth and hand out OCA brochures and tell people about the club. A number of OCA members did stop by including Dave Kodama, Bill & Suzanne Hall, Carlos, Vittal and others.

The OCA booth stayed open until the last raffle and passed out a lot of brochures. We had a number of people who stopped by and many were very interested in joining the club. At least one of those persons has joined the OCA.

Astro Physics Mount for Sale

- 1. AP 1200 GTO Mount with keypad**
- 2. 1200 Precision-Adjust Rotating Pier Adapter with Azimuth Bearing (1200RPA) for 10" ATS Pier.**
- 3. One 18 pound Counterweight for 1.875" Diameter Shaft**
- 4. 16" Mounting Plate**
- 5. Losmandy Polar Alignment Scope - (PASILL4)**
- 6. Polar Alignment Scope Cover - (Q12700)**

\$6,500.00

Contact Rick at 310-489-8561

Anza Site Reminders

by Bob Buchheim, OCA Secretary

Our Anza observing site is a very special asset of the Orange County Astronomers, one of the things that make us the best astronomy club in the country. Since this is your club, it's your site; and it seems appropriate to remind all OCA members that we need to care for our site just as we care for anything else that is "ours" – with a concern for safety, hospitality, security, and sanitation. This is especially true in the spring and summer months, when Anza sees its heaviest activity.

Safety: The site is in a rural high-desert area. It therefore has all of the hazards that you'll find in such areas: cactus with sharp thorns, rocks and ditches to trip on, and critters of various kinds. The critters include rattlesnakes (and some other non-hazardous snakes), vicious red ants, coyotes (usually only heard at night), tarantulas, scorpions, mice and gophers. Do be careful! Walk only on the roads and paths; use your red flashlight after dark; walk slowly – don't run; be aware of where you put your hands and feet; and don't mess with or tempt the critters. The neighbor's dogs sometimes wander onto our property, so it's best to keep your food inside your vehicle.

There are first-aid kits in the Observatory warming room and Anza House, but prevention is a better strategy than first-aid.

Pay particular attention to your children. They are likely to be excited about spending a night out-of-doors, which is good; but they're also likely to not have very good sense about what is appropriate, what is interesting, and what is risky. They rely on you for such wisdom.

The fire hazard is very real in this area, so please honor the "no smoking" rule at the site (smoking is permitted only in your closed vehicle – you keep the matches, ashes and the butts). Fires and guns are prohibited.

Be prepared for wide swings in temperature. Daytime temperatures in the summer can be hot to very hot (occasionally over 100F), and nighttime temperatures in the summer will be cool to cold (50F to 60F). Winter temperatures at night can be very cold – well below freezing on some nights.

There are no nearby services, so come prepared with clothing for both hot and cold weather, a supply of drinking water, and food.

Hospitality: The Anza site is always open for use by our members and their escorted guests. The site can get pretty busy during the summer, especially on star-party nights. Be friendly with the other members on the site, and be courteous of our neighbors (especially by limiting noise after dark – sound carries a long way). If you are hosting a group of more than 6 guests, please read and follow the "Guidelines for Groups at Anza" (available on the OCA website).

Security: Because the Anza site is always open, please do not publish or publically distribute the location or directions to the site. Regular users of the site know the combination to the Anza House lock, and to the power panel at the Observatory (where the lock for the Observatory bathroom is kept). If you don't know the combinations, ask any regular member.

Each person on the site has a special responsibility to see to it that the site is properly secured. If you're the last person on the site, please be sure to check that the observatory bathroom, warming room, power panel, and Anza House are all locked. If you're not the last person on the site, but you don't know the people who remain, please confirm with them that they'll take responsibility for locking everything up. We've had occasional instances when Anza House has been left unlocked – certainly not the way we'd treat our own houses. But, as I mentioned, if you're an OCA member, then Anza House is your house.

Sanitation: There is no trash service at Anza, so please pack out your trash when you leave. If you're one of the last to depart, please also take with you any trash that may have been left in Anza House.

Enjoy your Anza site, and keep it attractive for all of our present and future members!

Geo's Astrophoto Of The Week

George Robinson

Greetings from Palmia Observatory!

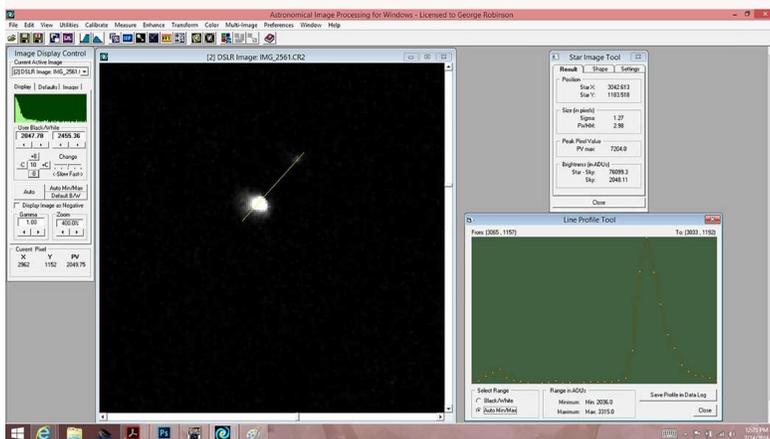
Most of this week was spent catching up on studying general relativity and gravity wave physics. It has been slow going trying to understand this stuff, but I found a set of Kip Thorne lectures, freely available on the internet, from a class he taught at Caltech on gravity waves. The lectures are pretty tough going and you better be pretty good at tensor calculus to keep up. I have to listen to them a couple of times and I can understand the homework, but can't often work out the problems on my own without looking at the solutions. Oh well, I'm making some progress on the physicist wannabe front.

One of our little group, Science Squad Gravity Guy, Ken, found an interesting paper that proposes an alternative explanation for what dark matter is. The authors say that dark matter might be made of, not massless spin 2 gravitons, but heavy spin 2 gravitons, which are not connected to ordinary baryonic matter and do not interact with ordinary matter and this is why it hasn't been detected in ongoing experiments and won't be produced in colliders like the LHC. It sounds far out but it could very well explain why 30 years of searching for dark matter has not turned up any evidence. Who knows? Thanks Ken.

Another paper just out by Sean Carroll proposes an idea for consideration that tries to establish a connection between quantum entanglement and gravity. It seems that the mathematics used to understand entanglement can be extended so that what we think of as gravity just follows automatically from entanglement considerations. Could this be the starting point of integrating gravity with quantum mechanics? I don't know, I can't really follow the paper. Its too hard. We have to wait and see. So, after wearing my self out on these papers, I met up with Trying to Build a Cubesat, Dr Don, for a four hour, and similar number of margaritas, lunch study session trying to understand quantum mechanical spin. How is spin of spin 0, spin 1/2, spin 1, or spin 2 particles tied together with the properties of the particles and the number of degrees of rotation needed to return a particle to the same state and symmetry condition? Anyway, my head was spinning for at least a couple of reasons. Thanks Don.

Ok, ok, back to some astro photos. I set up the little auto aligning mount with the 600 mm telephoto and started to get better prepared to begin gathering light curve data for the eclipsing binary star, Sheliak. Remember, Sheliak has a 12.9 day period and its brightness varies from about magnitude 3.3 to 4.3. I took a couple of images last week, with exposures from 5 seconds down to 2.5 seconds, but when I analyzed the photos, the star image was severely overexposed. This time I tried exposures from 1 second down to 1/8 second. They were all overexposed except the 1/8 second exposure. Now if Sheliak just happened to be at its maximum brightness, I can continue to use this 1/8 second exposure setting. But if the star just happened to be at its dimmest value, then sine a magnitude change of 1 corresponds to 2.5 times more light, the next round of images will be overexposed.

So, what to do next time? I think for now I'll just take at least two images per observation, one set at 1/8 second and another set at about 1/15 second or thereabouts. Hopefully that will take care of the problem. I can't set the exposure much lower than that because the signal to noise ratio will be a bit low for good accuracy. Anyway, I'll let you know what I start to find out.



While, I was collecting this data, and after Resident Astronomer, Peggy, had returned home, I was surprised by some visitors walking around the observatory grounds. Grandma Pam and just-about-a-teenager, Natalie, showed up and expressed some interest and curiosity, which was welcome. So I showed them some images of double stars like Mizar and the blue/gold double star, Albireo, and of course Saturn's rings. Natalie was quite excited and interested. I had forgotten some of the excitement that folks not used to looking at the sky with telescopes can experience and I was glad to be there to experience and share it. Thank you Pam and Natalie! Later, I reviewed an image of M13, which didn't show up too well in

the camera, but after some slight processing, turned out ok, at least for a 600 mm lens.

Finally, it was Saturday, and our big day, after waiting almost a year, of going to Mt. Wilson for a night of observing on the 60-inch telescope had arrived. This was our 3rd attempt, previous attempts cancelled due to clouds. The weather forecast was perfect for good viewing. The only problem was a large brush fire, the Sand fire, in nearby Santa Clarita, was kicking up a



lot of ash and travelling 10-15 miles towards Mt. Wilson. The forecast in the morning seemed quite clear. Later in the day, the forecast for ash at the telescope turned decidedly bad and the observatory staff cancelled our night of observing. It seems they were not going to open the dome and were not going to expose the telescope to any falling ash.

Darn, so just at 2:00 PM as we were getting ready to pack up and go, we got the email message saying the session was cancelled. This was our third cancellation and Resident Astronomer Peggy and I were quite disappointed. Now what to do? Even Astronomer Assistants Ruby and Danny were disappointed because they didn't get to



spend the night with Our House is Full of Dogs, Bob. Sorry guys. Well, my copy of Sky and Telescope had just arrived in the mail so that helped, but what really helped was a late lunch with a few consoling martinis at BJ'. Now that really helped assuage the disappointment. Now we have to wait again for the next available viewing date, sometime in November or December, or later, and we know that those months often get pretty cloudy.



Figure 24.1. "My big mistake was going into cosmology just for the money." This is the wrong way to think about cosmology! Copyright by S Harris, used with permission.

Well, that is about all I can take for this week. On balance we had a pretty good week with some success and some disappointment. I hope you all had a good week. Anyway, just for fun, I wanted to share a cartoon from a very good book, which I've been really enjoying, on gravity and cosmology,

"Gravity -- From the Ground Up", by Schutz. I think sometimes I'm in this field not to make money for me, but to deliver money to other folks. How about you? Until next time, George

Magazine Subscriptions

Subscriptions to the Astronomy magazines are now due for renewal, if you subscribed for one year or would like to subscribe at the club rate. You may also extend an existing subscription that does not end in December for one year at the club rate. Bring your check made out to the OCA to the meeting or mail it to:

Charlie Oostdyk, Orange County Astronomers, PO Box 1762, Costa Mesa, CA 92628.

Checks made out to the magazine publishers cannot be processed and will be returned to you.

If you already subscribe, please provide the mailing label or the billing invoice with your check.

One-year rates are as follows:

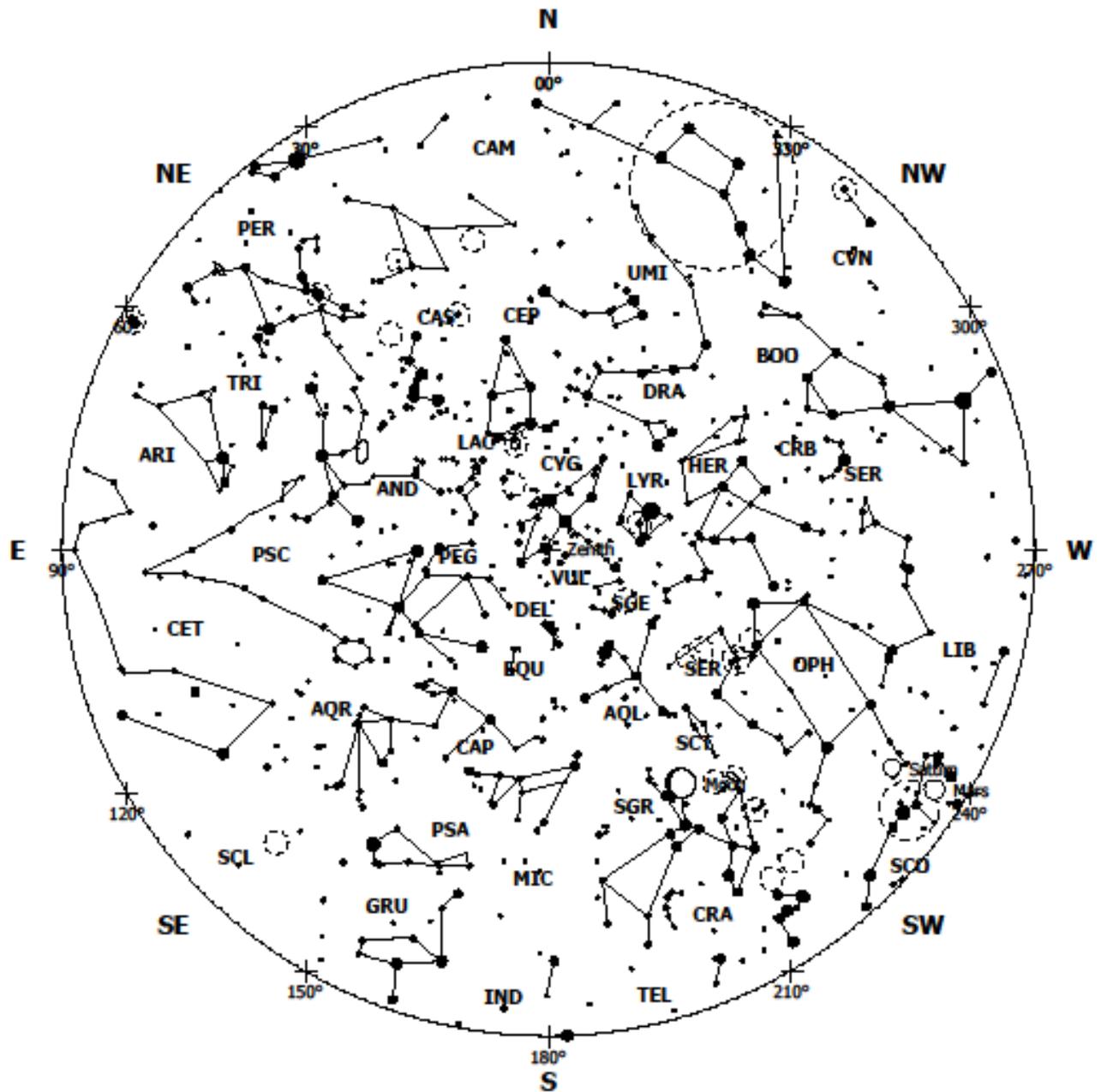
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***Sky & Telescope subscribers please note: Due to a change by the publisher, renewals of current subscriptions should now be made directly through Sky and Telescope! New subscriptions at the club rate must still be made through Orange County Astronomers and then renewed through the publisher.**

***Astronomy subscribers can now renew on-line with a credit card. E-mail Charlie@CCCD.EDU for special instructions and the renewal code.**

The **DEADLINE** for subscribing at the club rates will be the **October monthly meeting, October 14th**. The publishers will send expiration notices to all current club subscribers about November 1st even if you renew through the club. It takes the publishers a few weeks to process renewals.

August 2016 Whole Sky Chart



Symbols			Magnitudes											

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: 2016-08-15 00:00:00
 Universal time: 2016-08-15 07:00:00
 Julian date: 2457615.79167
 Sidereal time: 20h 43m 43s

View
 Field of view: 200° 00' 00"
 RA: 20h 43m 43.47s, Dec: +33° 46' 01.0"
 Azi: 180° 00' 00.0", Alt: +90° 00' 00.0"
 Constellation: Cygnus

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

RETURN SERVICE REQUESTED

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