SIRIUS ASTRONOMER

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The Newsletter of the Orange County Astronomers

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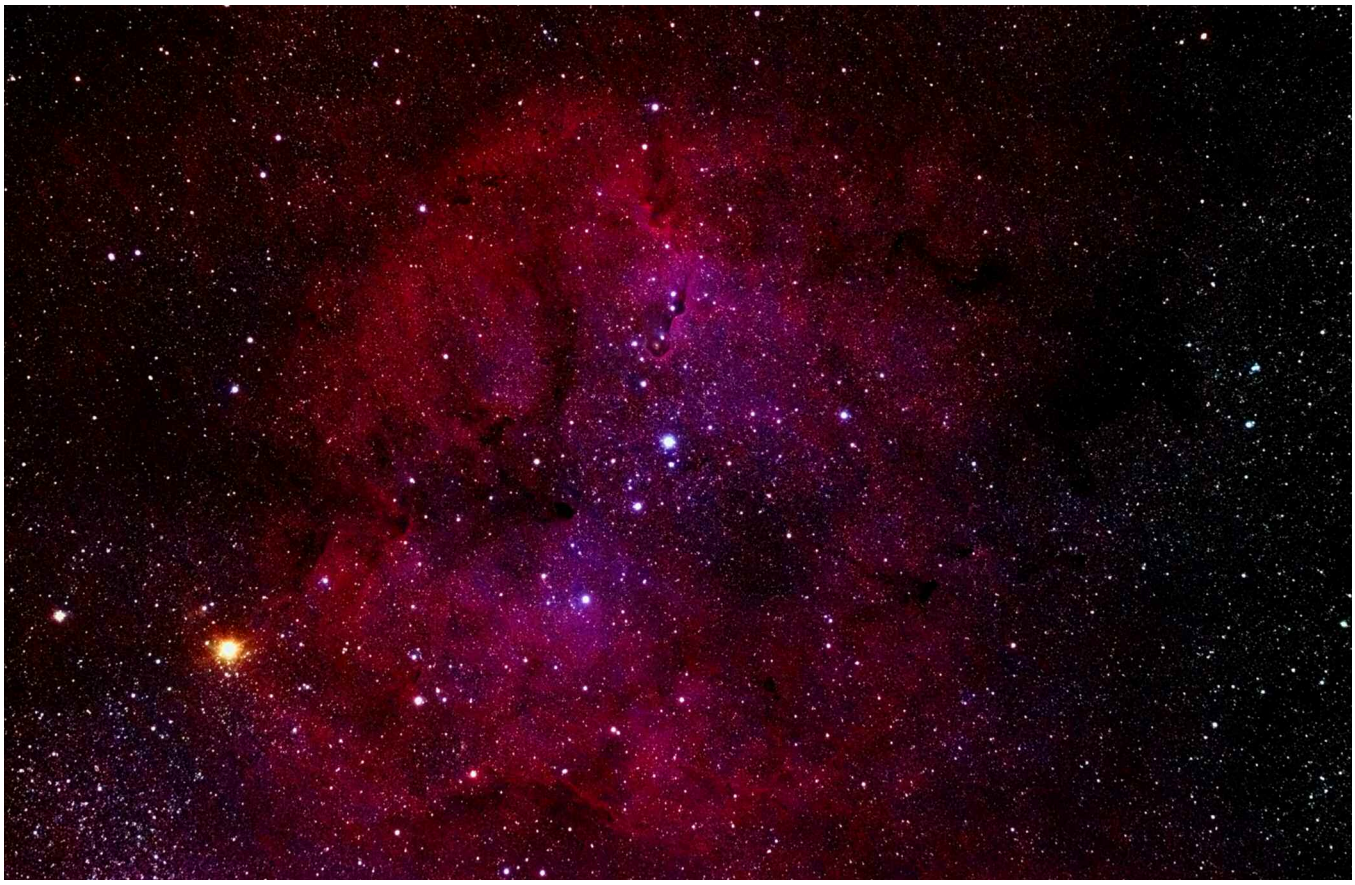


IC1396 Emission Nebula, including the Elephant's Trunk, imaged by Rick Hull on the nights of June 22,23 and 25, 2017 from the OCA Anza site. He used a William Optics 80mm semi-apo refractor operating at f/5.5 on an unmodified Canon 6D full frame DSLR, ISO setting 1600. Just over 5 hours of total integration; it is comprised of 44 subs, 7 min each. At over 100 ly across, the nebula surrounds an open cluster 2400 ly away in the constellation Cepheus. The bright, blue O star near the center is likely the dominate radiation source for the ionization of the gas cloud.

OCA CLUB MEETING

The free and open club meeting will be held on November 10 at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange.

This month, Tamitha Mulligan Skov will speak about Space Weather: Our Changing Sun and its Effect on Our Modern World.

NEXT MEETINGS: December 8, January 12 (speakers TBA)

STAR PARTIES

The Black Star Canyon site will open on November 11. The Anza site will be open on November 18.
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 November 3 and December 1.

Youth SIG: contact Doug Millar
Astro-Imagers SIG: Nov 1, Dec 6
Astrophysics SIG: Nov 17, Dec 15
Dark Sky Group: contact Barbara Toy

President's Message

By Barbara Toy

Theoretically, we're heading into winter soon – the winter constellations are coming up earlier all the time, giving a hint of possibly cooler weather to come. However, the local weather as I write this hasn't gotten the message, and we're in yet another heat wave and Santa Ana Wind condition that played havoc with the Anza star party on October 21, though, fortunately, without any significant reports of fire. The wind was gusting strongly enough to make me worry about its effect on the open roof of the club observatory, and the gusts kept shaking the Kuhn telescope, making the viewing that was already problematic through the unsteady atmosphere even worse. Once I shut the observatory down, feeling much happier when the roof tie-downs were in place and the south flap was up and locked, I discovered that even those with dome observatories were having problems, and pretty much everyone shut down early. It was such a nice, clear night, too – showing that there is more than one way nature can spoil our viewing and imaging.

Fire Concerns

That comment about fire really wasn't just a throw-away – fire is a very real danger at Anza as well as Orange County (the October Black Star Canyon star party, which was to be held near Irvine Lake to try that out as a possible replacement permanent site for the site we've outgrown, had to be cancelled due to the Canyon II fire). Long-time members can remember the year we had fire burn across about a third of our Anza site, fortunately without damaging any of the buildings. That was a wake-up call, but we often are not as diligent as we should be about keeping areas around the structures and viewing pads clear of weeds and shrubs, so that there are defensible spaces around them. The only damage that I recall we had during that last fire was to a pad work table and an electrical outlet post where the grasses had not been cleared away and gave the fire an easy path to reach them. Fortunately, thanks to the diligence of the fire fighters, that fire didn't get down to the area around Anza House or the Football Field, which frequently don't get the clearance they need and can be more vulnerable than other structures on site.

If you're out at the Anza site, please take notice of these conditions. If you see weeds encroaching on an area you're using, please take a few minutes to pull them out or cut them back. At this time of year, a lot of the seasonal growth like grasses and mustard is brittle and generally easier to clear away than in other seasons. If you notice that weeds or bushes are growing too close to a structure but you aren't able to do anything about it yourself, please let someone on the Board know about it.

Other Anza Concerns

One of the Anza regulars recently reported to me that a couple of people had been staying at Anza House when there were other members on the site, and that they locked the door when they went to sleep, making it difficult for other members who needed to use the facilities. If you're staying at Anza House and there are other members on site, please remember that they need to be able to access it easily, for both the bathrooms and the kitchen. The general rule is that, when others are on the site, particularly on the lower half of the site where Anza House would be closer to them than the club observatory, the house is to be kept open so everyone there can use it.

Another rule is that, if you're the last one to leave the site (or think you may be the last one), please lock Anza House before you leave after making sure that the heaters, air conditioner, lights and appliances are turned off, and also close and latch the main gate on the way out. If you're up by the club observatory, please be sure the restroom and the warming room are both locked and the keys are put in the lock box. For both Anza House and the observatory, please be sure the combination on the locks is hidden by setting all the numbers the same (such as all zeros or ones).

People seem to have been pretty good about taking the trash with them when they leave recently – thank you! We don't have trash service out there, and the rule is that everyone on the site is responsible to take his/her own trash out with him/her when leaving. The results can be pretty pungent when trash is left behind, and it attracts rodents, so it's really important to follow this rule.

As a last matter on the Anza site – we periodically change the combination for the locks for Anza House and the Observatory, and believe that the next change will be this winter, though I'm not sure yet exactly when that will be. We'll put out notices when the change is made, and who to contact to get the new combination, so please keep a lookout for that.

OCA Elections

The nominations for the OCA Board for 2018 close at the end of the general meeting in November – if you want to run for office, please email our club Secretary, Alan Smallbone (asmallbone@earthlink.net) to be put on the ballot.

You have to have been a club member for at least a year to qualify to run for Trustee, Secretary or Treasurer. You have to have been a member of the Board for at least a year at some time to qualify to run for President or Vice President. As I said last month, I know there are a lot of you who have these qualifications and who could bring new perspectives and areas of expertise to the Board as members – please do consider running!

We Still Need a New WAA Representative

Last month I talked about our involvement as a club with Western Amateur Astronomers (WAA), and that our long-time representative to WAA, Tim Hogle, would like to retire from that position. I won't repeat all the information about WAA and what the representative would most likely do, but want to remind you that this position is still open and Tim is hoping to be able to overlap with whoever will be taking that over from him to make it easier for that person and ease the transition. If you are interested, please contact Tim Hogle (TimHogle@aol.com) or me (btoy@cox.net).

A Sad Farewell to Larry Gershon

Lawrence Gershon, who most of us knew as Larry, was a long-time OCA member who was active in the AstroImage Group and often came to the general meetings as well. He did most of his imaging from his back yard in Seal Beach, where sky glow is a real challenge, or from the meadow by a cabin that he and his wife, Bobbi, had near Yosemite, which was much darker. Conversations with Larry were always interesting – he was a man of many interests, as varied as astronomy, astrophysics, silversmithing, bicycling, cooking, traveling and learning languages, and he was an endocrinologist by profession before retirement.

Larry Gershon

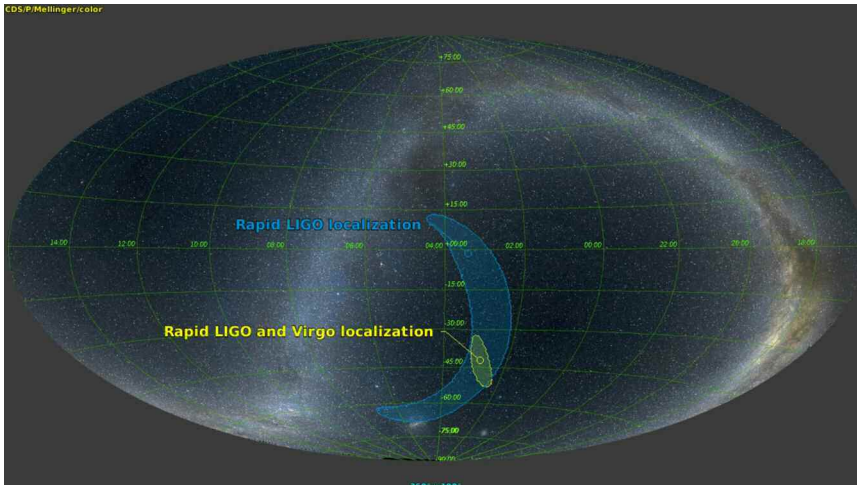
We noticed that he hadn't been coming to meetings for the last few months, but thought he was off on a trip or that something else he was doing conflicted with them. We learned recently from his wife that the conflict was much more serious – he was diagnosed with pancreatic cancer about ten months ago, and passed away on October 8, 2017, a sad loss for all who knew him.

If any of you have memories of him that you would like to share with his wife and family, please send them to Alan Smallbone or me and we'll be happy to pass them on.

AstroSpace Update

November 2017
Gathered by Don Lynn from NASA and other sources

Another gravitational wave – The 4th ever detection of a gravitational wave was announced in September, and like the previous, its shape says it was generated by 2 somewhat massive black holes (31 and 25 times the Sun's mass) merging. This time the European gravitational wave detector Virgo was also operating, in addition to the 2 LIGOs in the US. 3 detections allow determination of the source to an area of about 60 square degrees of sky, whereas 2 detections allow only the determination of an area of about 1000 square degrees. Those 60 square degrees are centered on a point near the star Theta Eridani. From the strength of the wave, it was determined to have originated 1.8 billion light-years away. There are millions of galaxies in 60 square degrees, so we can't pin down exactly the source. The 3rd detector allowed determination of the polarization of the wave, and it is one of the two types of polarization (of 6 possible) predicted by General Relativity to be produced by black hole mergers.



Credit: LIGO/Virgo/Mellinger

The Nobel Prize in Physics – This year was awarded to 3 of the key people in developing LIGO, which first detected gravitational waves in September 2015: Kip Thorne, Barry Barish, and Rainer Weiss. They are emeritus professors of Caltech (Thorne and Barish) and MIT (Weiss). The Nobel rules allow sharing of a prize by no more than 3 people. A press release from Caltech named 16 people who had key roles in the discovery of gravitational waves. The team who built LIGO and the team who run and analyze it are believed to each have over 1000 members. It would be nice if large teams could somehow share in Nobel Prizes.

Close encounters – Gaia (star position space telescope) recently made its 1st release of data, giving extremely precise positions and motions for more than 2 million stars (and positions, but not motions of a billion stars). A study was made of this data to find stars that have passed or will pass close to the Solar System. From this, they calculated that a star passes within 3 light-years of us every 50,000 years, on average. The closest known pass within the next 5 million years will be the star Gliese 710, at about ¼ light-year, 1.3 million years from now. It will then be the brightest star in the night sky. Such close visits likely disturb comets from the Oort Cloud into the inner Solar System. However the estimates of the frequency of comets from such a visit vary considerably by different astronomers.

Millisecond pulsars – LOFAR (low-frequency radiotelescope array mostly in the Netherlands) has discovered 2 more millisecond pulsars (ones that rotate hundreds of times per second, so that successive blinks are a few milliseconds apart). One of these, dubbed J0952-0607, is now the 2nd fastest known pulsar, at 707 revolutions per second. It is roughly 4000 light-years away in Sextans. Millisecond pulsars are believed to spin so fast due to material falling onto them from a companion star, pushing up the spin rate. These 2 were probably overlooked by other radiotelescopes because they are bright only in low frequency radio waves, not in the higher frequencies observed by most radiotelescopes.

Tabby's Star – (aka KIC 8462852) has shown short-term and long-term variations in brightness that do not fit any known cause. Theories as bizarre as an intelligently-built megastructure have been proposed. A new study in ultraviolet, visible light and infrared shows that a huge uneven dust cloud orbiting around the star about every 700 days can probably explain the long-term variations. Observations used in the study included many made by a group of Belgian amateur astronomers using a 27-inch scope. Scientists are still working on explaining the short-term variations. The star was nicknamed after Tabetha Boyajian, lead author of the original paper describing its bizarre light variations.

Superluminous nova – A few novas stand out as being much brighter than typical novas, but still not as bright as supernovas. These are called superluminous novas. New observations of a superluminous nova known as ASASSN-16ma (it was discovered by the ASASSN automated sky survey) show that the brightness over time in visible light exactly tracked the brightness in gamma rays. But it has been shown that the gamma rays are produced by shells of gas

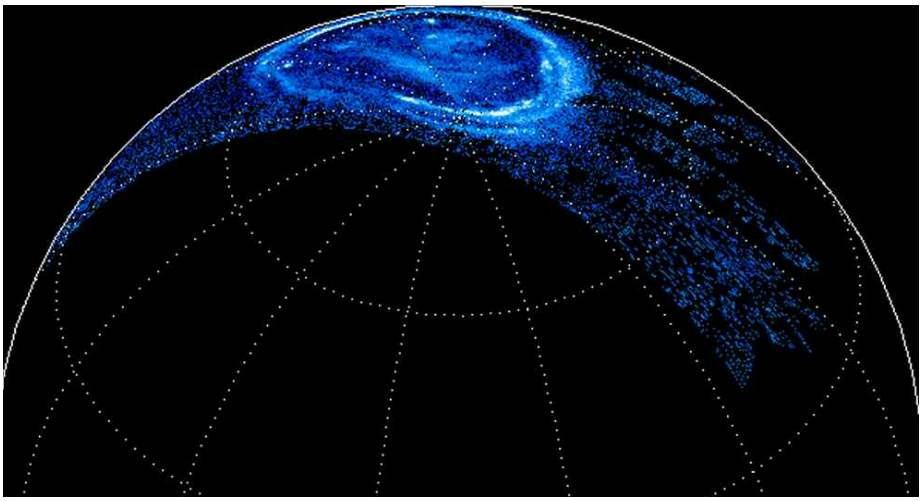
expanding at different speeds and bumping into each other. So the extra brightness in visible light must have the same cause. The shells of gas were thrown off both by stellar winds and by the nova explosions.

Early galaxies discovered – A research team has found 6 galaxies that are so far away that we are seeing them as they appeared at the time of reionization. That time is about 800 million years after the Big Bang. It is so called because that is when the first galaxies got bright enough in ultraviolet light to ionize (knock the electrons off) the mostly hydrogen gas that filled the Universe. Only 3 galaxies from this time period were known before this search. Analysis of these galaxies indicates reionization was about half complete at the time we see them, and reionization may have occurred patchily.

Binary black holes – Five new pairs of binary supermassive black holes have been discovered at the centers of galaxies. These are believed to result from galaxies colliding, and last only until the black holes from the individual galaxies slowly spiral together. The search for binary black holes began by scouring Sloan survey images for galaxies that looked like they were merging, then trimming the results by requiring that infrared images looked like black hole activity and X-ray images looked like binary sources. Both the X-ray and infrared images indicated that the 5 pairs were buried deeply in dust and gas, so would be difficult to find in other wavelengths of light that do not penetrate dust and gas as well.

Binary main-belt comet – Astronomers have discovered the 1st known binary asteroid that is also classified as a comet, due to its emitting a coma and tail. A handful of asteroid/comets (called main-belt comets) are known, but they are all single objects. The best theory is that the newly found object spun so fast that it broke in two, probably about 5000 years ago considering the distance at which they now orbit each other.

Haumea – The 3rd brightest dwarf planet in the Kuiper Belt, was observed by a string of telescopes last January when it transited (passed in front of) a star. A lot was learned from this: It is larger than previously estimated; it is less reflective; it is much less dense; it has a ring about it. From its light curve it was already known that it rotates quite fast (3.9 hours) for an object this size, and that rotation caused it to assume an elongated shape. That shape and the current rotational phase (nearly minimal area seen from Earth during the transit) had to be taken into account in using the transit times of the various observers to compute Haumea's size. The new size measurement puts Haumea's longest dimension (1442 mi = 2320 km) at 97% the diameter of Pluto. The ring has a radius of 1431 miles (2287 km) and lies in the same plane as the rotational equator. The ring particles orbit with exactly 3 times the period as Haumea's rotation. The ring is dark and narrow. The new lower density puts it much closer to that of Pluto's, and thus probably has a similar makeup of roughly equal amounts of ice and rock.



Jupiter aurora. Credit: NASA/Bertrand Bonfond

Juno – spacecraft has been observing the aurora on Jupiter. Findings include that electric charge differences along magnetic field lines accelerate electrons to energies more than 10 times the energy of similarly accelerated Earthly aurora electrons. However, the brightest Jovian auroras result from some other source, which will be investigated.

Vesta ice – The Dawn spacecraft orbited asteroid Vesta for 14 months beginning in 2011. New analysis of its radar data shows that in some areas of Vesta something near the surface is reflecting radio waves, likely water ice. This was not expected, because Vesta shows evidence of being hot in the distant past such that it melted and heavier material sank to the center. This melting should have driven water (as vapor) into space, where it would be lost. This implies that water was delivered to Vesta, probably by collisions, after the melting period. Scientists had to subtract surface roughness effects on the radar data to uncover the effect likely due to ice.

Mercury ice – A new analysis of MESSENGER spacecraft data shows that there is evidence of water ice at the limits of resolution of the data. This implies that the past studies, which found large patches of ice near the surface (chiefly in shadowed polar craters), missed the smaller patches, and thus missed much of the ice there. The new study included laser altimeter data in addition to the previously studied neutron data.

Ice blades in Chile. Credit: Wikimedia Commons/ESO

Pluto ice blades – Among the strange features that New Horizons spacecraft found at Pluto is the bladed terrain, where blades of methane ice stick up from the surface. A new theory explaining this terrain is that it is the same as the much smaller blades of water ice that are found on Earth (in Chile). Large areas freeze, then erosion shapes the ice into blades. The Earthly ones are only a few feet high, but the Plutonian ones are hundreds of feet high. The different material, different temperatures, different gravity, and different time scales of temperature change probably explain the height difference. The bladed terrain is found on Pluto only in the highest equatorial regions where methane snowfall or frost accumulation is expected to be heavy.

Titanium oxide – has been detected in the atmosphere of the hot-Jupiter exoplanet WASP-19b. It is so close to its star that its atmospheric temperature is estimated at 3600°F (2000°C), and it orbits in only 19 hours. Also found were water and traces of sodium, but this is the 1st time titanium oxide has been found at an exoplanet. Certain cool stars have titanium oxide, but it is rare on Earth and other planets. The detection was made using the Very Large Telescope in Chile while the planet transited its star.

Dark planet – Hubble Space Telescope has observed a hot-Jupiter exoplanet named WASP-12b and found that it absorbs light so well that it appears as dark as asphalt. As with any Jupiter-like planet, its atmosphere is mostly hydrogen. At this planet's temperature (4600°F = 2500°C), no clouds of any composition form (which would reflect light), so light just penetrates deeply until it gets absorbed by the gas. WASP-12b is 1400 light-years from us in Auriga. It orbits its star once every Earth day. The observations were made before and during when the planet passed behind its star, since the planet and star are too close to resolve separately, even with the Hubble.

Cosmic ray sources – It has long been known that cosmic rays seem to arrive from all directions in space equally. It is believed that this is because magnetic fields in space divert their directions of travel into a homogeneous scramble. New data from the Pierre Auger cosmic ray observatory in Argentina show this is not true for extremely high energy cosmic rays (extremely fast moving particles). It was expected that magnetic fields would have less effect on more energetic rays, but there was insufficient data to show this until now. The new data show slightly more cosmic rays arrive from one half of the sky than from the other. The hotter side is centered near Canis Major. This is not aligned with the Milky Way, so the source of the high-energy cosmic rays is likely outside our galaxy. Scientists think that the low-energy cosmic rays likely come from within our galaxy, perhaps from star-forming regions and supernova remnants.

Hypervelocity stars – are ones traveling so fast that they may leave their galaxy. Only about 20 of them are known in our Milky Way. 2 more of them have been found by the LAMOST spectroscopic survey. It is thought that they achieve their high speeds during gravitational interactions with the supermassive black hole at the center of the galaxy.

Milky Way mass – It is difficult to measure the mass of the Milky Way, including its halo of dark matter, because almost any object whose motion we can track is still inside the huge halo, and thus not gravitationally affected by the entire mass. A new method using computer simulations to match the motions of hypervelocity stars produced a Milky Way mass somewhere in the range 1.2-1.9 trillion solar masses. These are tighter bounds than previous methods.

Asteroid moons – Radar observations of the asteroid 3122 Florence showed that it has 2 small moons. This is only the 3rd known triple asteroid among the near-Earth population, though 14 are known in the asteroid belt. The observations also confirmed previous estimates of Florence's size (2.8 miles = 4.5 km). The sizes of the moons are imprecisely known, about 300-1000 ft (100-300 m).

Lunar atmosphere – A new study of the Moon and Apollo moon rocks determined that about 3.5 billion years ago, when the lunar "seas" were formed by volcanic activity, enough volcanic gas should have been emitted to give the Moon about 1% the atmospheric pressure that we experience on Earth. The atmosphere dissipated in probably 70 million years. Some of the gas would have been water vapor, which probably contributed to the ice still found in shadowed polar areas.

Martian aurora – On September 11, the Sun threw off a huge coronal mass ejection, but it missed Earth, but not Mars. The MAVEN Mars orbiter detected Martian aurora 25 times brighter than anything it has seen before. The Curiosity rover recorded radiation levels at the surface double anything seen previously. 3 other Martian orbiters also detected effects of the Sun's ejection. Mars would have then been a pretty place to observe aurora, but with dangerous radiation.

Martian volcano – Analysis of 6 meteorites (of nakhlite variety) known to have been blasted off Mars by an impact 11 million years ago showed that a single Martian volcano continued to erupt over a time span of 90 million years. Typically Earthly volcanoes erupt for only a few million years, due to tectonic movement shutting down eruptions, but Mars does not have tectonic movement. It is believed that the eruptions of this volcano continued much longer than 90 million years, but we have only a small sample in the 6 meteorites. The volcano involved is believed to be Elysium Mons, and the scientists involved in the new analysis think they have identified the impact crater left when the meteorites were blasted off.

Martian boron – Mars rover Curiosity has found the element boron for the 1st time on Mars. It was contained in calcium sulfate mineral veins, and likely was present in ground water when the veins formed. It is thought that when RNA first formed on Earth, in the process of life being created, it involved boron. Another piece in the puzzle of whether life ever existed on Mars.

Thirty Meter Telescope – Construction has been halted since 2015 on the Thirty Meter Telescope in Hawaii, due to protests, law suits, and additional hearings. The latest hearing ended with permission to resume construction, if additional conditions are met. However, construction will likely not proceed until an imminent appeal to the state supreme court is concluded.

Deep Space Gateway – Congress and the administration have changed their minds again. The mission to have astronauts visit a captured asteroid (or parts) has been canceled. However support continues for the Deep Space Gateway, a space station smaller than ISS, which would orbit between the Moon and its L2 Lagrange point behind it. The Gateway will serve as a base for astronaut/cosmonaut (and robotic) missions to the Moon and eventually to Mars. The Gateway

Instant AstroSpace Updates

New measurements of the **moons of Uranus** indicate that Cressida will likely collide with Desdemona in the next million years; previous work showed that Cupid and Belinda will collide in less than a billion years. Not clear if these will create new rings, or 2 larger moons, or many smaller ones.

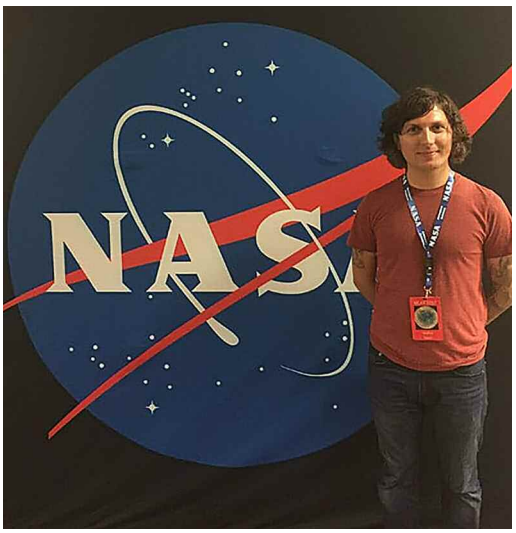
A new study determined that there are 68 known exoplanets from which at least one of the Solar System planets could be seen to **transit the Sun**, though most are not in habitable zones (where temperature allows liquid water to exist). Is someone watching us?

The Jansky **Very Large Array** radiotelescope in New Mexico started a new survey of 80% of the sky. Because of sensitivity improvements to the telescope, it is expected to quintuple the known radio objects in the sky.

Due to testing taking longer than scheduled, the launch of the **James Webb Space Telescope** has been pushed back from October 2018 to March-June 2019.

OCA Member Goes From Musician to Student to NASA Intern

By Vadim Taver



I was a straight A student in high school growing up in Pennsylvania and like many I had no real plan for an "adult career." In fact, my only real interest at the time was playing music and I was fortunate enough to have found an underground music scene to call home. I've been playing in bands throughout high school and suddenly my bands started gaining some popularity. I signed to my first record contract and did my first real touring during the Summer immediately upon graduation. Seeing no future in a career in music, my mother constantly lectured me about how important college was and I registered for my first semester at The College of New Jersey with no declared major. During the next year, I became so disillusioned with studies and so miserable with the college experience that I let my grades become the worst they have ever been. Sound familiar? Was this partially due to the excitement of playing/recording music and traveling the world in my late teens? Probably. Was it partially due to not having any idea what I wanted to do for THE REST OF MY LIFE? I would say this was the major factor. How can an 18 year old possibly make this kind of decision? Yet we are forced into this mentality and expect to pursue college after already having done school for what feels like our entire lives up to that point. With absolutely no focus at college and great disappointment to my mother, I decided school was no longer for me with the thought that I could always return at any point in my life. This point came almost 15 years later.

I was fortunate enough to be able to do what most people only dream of in my post-high school years. I have released multiple albums of my music both with bands and as a solo artists. I have played hundreds of shows and festivals around the United States, Canada, and Japan. I was able to meet people from all over the world and make life-long friendships and relationships that would have never been had I not done those things right after graduation and stayed in college. In no way would I take back any of it. However, after touring for many years and moving to California in 2006, I found that unfortunately music wasn't as sustainable as I thought it may be as an adult. I've worked jobs at record labels, vinyl distributors, clothing brands, gave private guitar lessons, and in the last five years have been teaching an after-school chess program throughout Orange County Elementary Schools - still with no real long-term goal in mind. That is until 2014 when I re-watched the original Cosmos series with Carl Sagan. I don't remember what inspired me to do so in the first place but I was hooked. There was so much information and so much wonder in our universe and I haven't ever really been looking.

In the Soviet Union (where I lived the first 7 years of my life), Yuri Gagarin was a household name, a national hero, so there were instances where I've thought about space. But, I never really gave much thought to learning more about the mysteries all around us until just a few years ago. I began re-teaching myself algebra, trigonometry, and pre-calculus by way of Khan Academy online for free and placed right into Calculus at Golden West College for Spring of 2015. I chose physics as my major as astronomy isn't available as a major at the Coast Colleges and began to knock out class after class. While working 2-3 jobs during the weekdays, I went to classes in the evenings and did homework all weekend, even listening back to my recorded physics lectures while driving in my car from job to job. I managed to get straight A's in every single class, one after another. Slowly I was making my way through the math and science-heavy STEM curriculum when I decided to contact the head of the science department for a meeting to which she agreed.

She made me aware of a program called Jet Propulsion Laboratory Undergraduate Scholars (JPLUS) which Golden West College participates in and told me she could nominate me when the time came if I was interested. A single student is selected from each participating southern California community college to represent the entire campus for this program. I was thrilled when I was accepted into the program beginning in the Summer of 2016. Our group consisted of about 30 students and we met at JPL in Pasadena for meetings at least once per month with the option for many more at both JPL and Caltech. We were badged as an official intern with a photo government NASA ID (still surreal to me), and were granted access to the premises for 7 months. This time was spent attending lectures of various forms such as choosing a career path, how to write a proper resume, how to present yourself at conferences,

how to write proposals, etc. We were also able to explore various facilities, labs, the Hub (a library and hangout with accessible 3D printers) and encouraged to network as much as possible.

The most exciting place we visited was the Space Flight Operations Facility where NASA's Deep Space Network (which has been in use for over 60 years, 24 hours a day, 7 days a week) communicates, monitors, and controls all unmanned NASA's spacecraft beyond low earth orbit including the Curiosity and Opportunity rovers on Mars, the New Horizons space probe that flew past Pluto a couple of years ago, and Voyager 1 – the farthest manmade object launched into space. JPLUS is coordinated by NASA's Office of Education whose entire budget was in danger of being slashed by the latest federal budget proposal but thankfully was recently modified. JPLUS also made us aware of other NASA/JPL opportunities as well as internships and I applied for another program called NASA Community College Aerospace Scholars (NCAS) and was accepted beginning in January 2017.

NCAS began as an online course where many videos, articles, etc were made available to us and quizzes were given to monitor our progress. The overall theme was sending humans to Mars, as this is one of the upcoming missions that NASA and other private companies are preparing for within the next decade or two. At the end of the class we were provided a few choices for a final project which included designing a Mars rover and proposing our own Mars mission. The submissions were evaluated by staff and the best essays were chosen and selected to participate in a week-long stay at a NASA location for a group project.

I was chosen and in July of 2017 returned to JPL for a week filled with fun and stress. The participants were split into 4 teams (I was on the RED team – which per my suggestion we named "700 nm" one of the wavelengths of visible red light). During the week, we were presented with lectures from NASA engineers, had panel discussions with past interns who now hold positions at JPL, and were given projects of our own to complete and present by the end of the last day. One of the projects was to design and build a rover from a Lego Mindstorms EV3 robotics kit that could retrieve "Mars rocks" from certain terrains. The kit had various censors such as a gyroscope and the central brick computer had to be programmed for the various robotic commands we wanted it to carry out. During this week we got to visit Mission Control again. We also got to see a gigantic clean room where engineers were dressed in white bunny suits as they worked on future experiments going out in space such as on the Mars 2020 Rover.

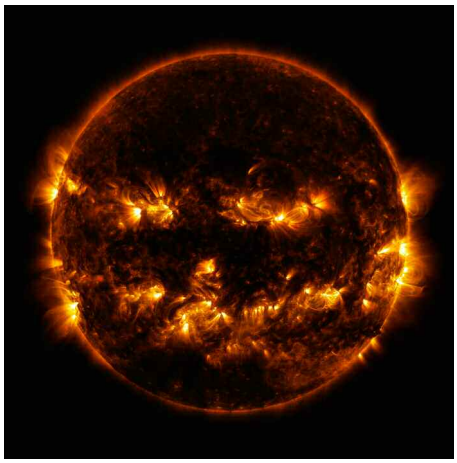
JPL has an area called The Mars Yard where the rocky terrain mimics the conditions on Mars's surface, which I've visited before during my time at JPLUS. What I didn't know was there is a garage there containing an almost exact replica of the Curiosity Rover named Maggie, that is used to troubleshoot and run tests with before commands are sent to Curiosity. We got to explore her up close and personal. We also saw a model for a NASA project in development called Starshade which is essentially a giant flower that will open up in space with a detector in the middle. The "pedals" are composed of a reflective material so when focusing on a particular area of space, most unwanted light will be reflected and the detector will collect only a limited number of photos, thus hopefully making another new technique for exoplanet detection.

For now my time at JPL has come to an end, but I have made contacts and networked enough to have a big foot in the door. This Spring I will be awaiting acceptance into university to begin an astrophysics program, and will hopefully return to JPL for an internship position where I will be able to work on an actual project that will one day depart from this Pale Blue Dot. Carl Sagan may have been my inspiration to pursue a new interest but he has done so much more. He has given me, in my 30s, an entirely new chapter in life and has made my mother very happy with my decision to return to school. If you are unsure about where your life is heading, your career, etc. just remember that you are the facilitator of your own destiny. If someone would have told me 5 years ago that I would step foot into NASA, I would have laughed at how impossibly absurd that situation would be, and yet in just a few years and a lot of hard work, I am experiencing my dreams and have set course for a new career and life.

Spooky in Space: NASA Images for Halloween

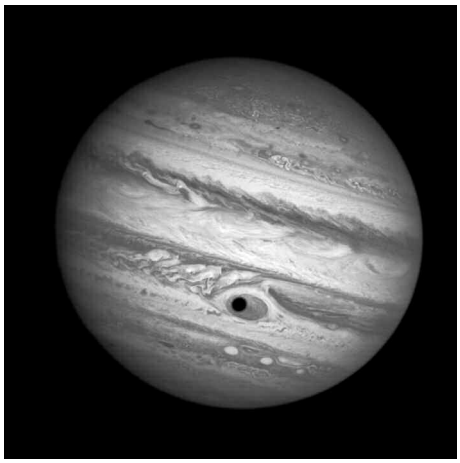
By Linda Hermans-Killiam

Have you ever seen a cloud that looks sort of like a rabbit? Or maybe a rock formation that looks a bit like an elephant? Although you know that a cloud isn't really a giant rabbit in the sky, it's still fun to look for patterns in images from nature. Can you spot some familiar spooky sites in the space images below?



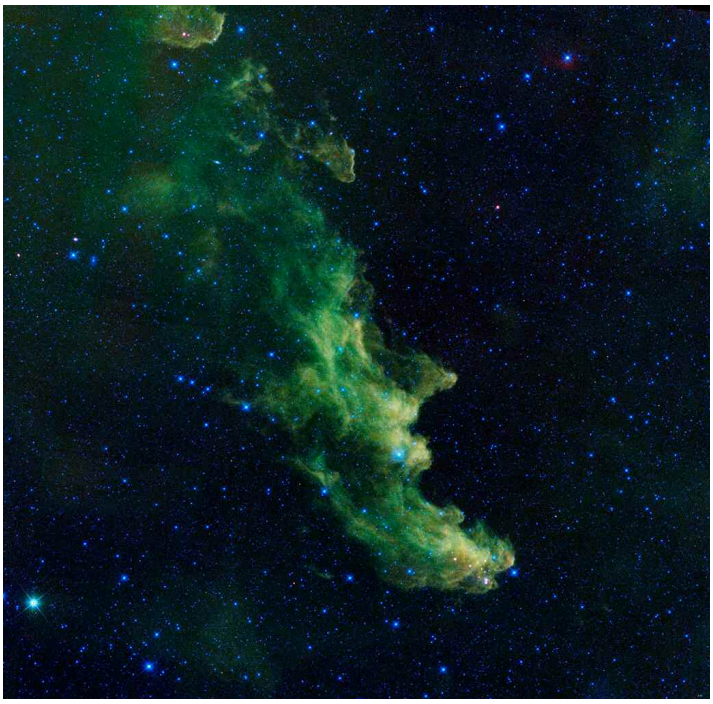
Credit: NASA/GSFC/SDO

This might look like the grinning face of a jack-o'-lantern, but it's actually a picture of our Sun! In this image, taken by NASA's Solar Dynamics Observatory, the glowing eyes, nose and mouth are some of the Sun's active regions. These regions give off lots of light and energy. This causes them to appear brighter against the rest of the Sun. Active regions are constantly changing locations on the Sun. On the day this image was captured, they just happened to look like a face!



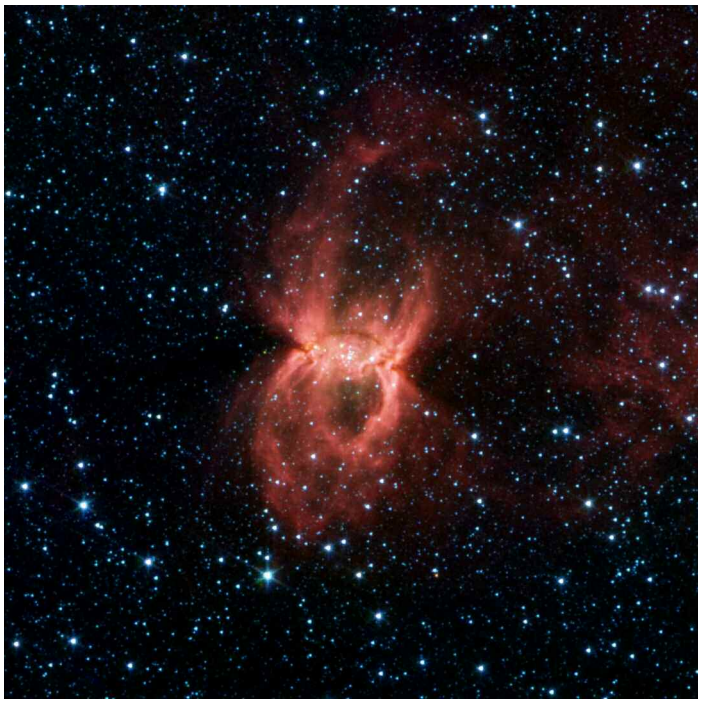
Credit: NASA/ESA/A. Simon (Goddard Space Flight Center)

This is a Hubble Space Telescope image of Jupiter. Do you notice something that looks like a big eye peeking back at you? That's actually the shadow of Jupiter's moon Ganymede as it passed in front of the planet's Great Red Spot. Jupiter's Great Red Spot is a gigantic, oval shaped storm that is larger than Earth and is shrinking. It has been on Jupiter for several hundred years, and its winds can swirl up to 400 miles per hour!



Credit: NASA/JPL-Caltech

Can you see the profile of a witch in this image? This image, from NASA's Wide-Field Infrared Survey Explorer, shows the Witch Head nebula. The nebula is made up of clouds of dust heated by starlight. These dust clouds are where new stars are born. Here, the dust clouds happen to be in the shape of an open mouth, long nose and pointy chin.



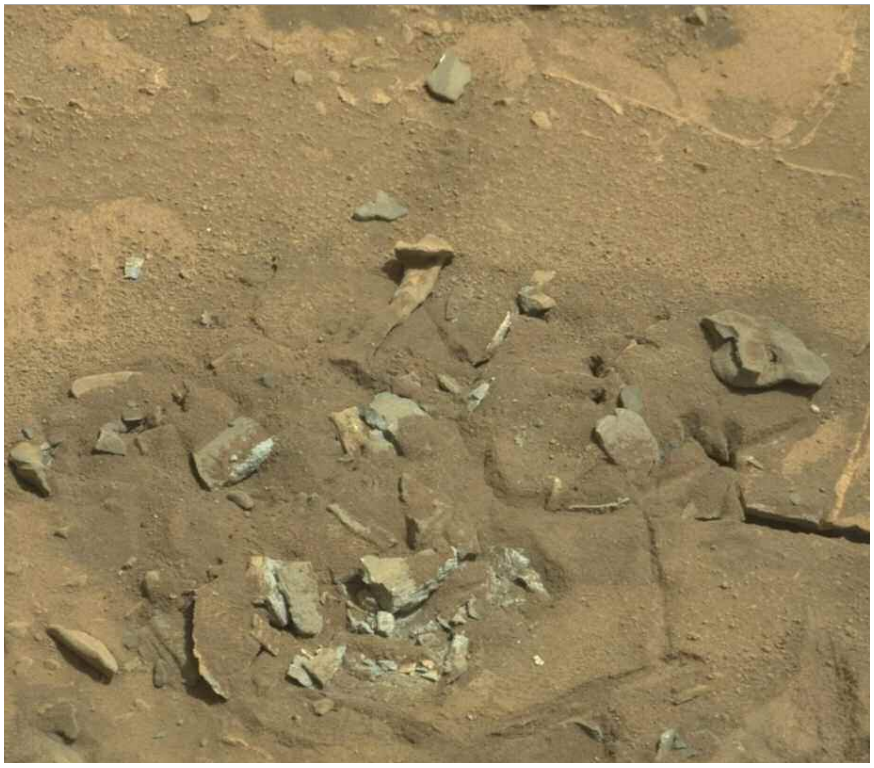
Credit: NASA/JPL-Caltech/Univ. of Wisc.

The Black Widow Nebula looks like a giant spider in space. It is a huge cloud of gas and dust containing massive young stars. Radiation and winds from these stars push the dust and gas around, creating a spider-like shape. This image is from NASA's Spitzer Space Telescope.

Did a skeleton lose one of its leg bones on Mars? Nope! It's just an image of a Martian rock. NASA's Curiosity rover captured this image. The rock was probably shaped to look this way over time by wind or water. If life ever existed on Mars, scientists expect that it would be small organisms called microbes. So, it isn't likely that we'll ever find a large fossil on Mars!

To learn some fun planet facts and make a planet mask, check out NASA Space Place: ***https://spaceplace.nasa.gov/planet-masks***

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.*



Credit: NASA/JPL-Caltech/MSSS

December Guest Speaker: Dr. Daniel K. Stern

Spinning Black Holes, Exploding Stars, and Hyperluminous Pulsars: Recent Results from the NuSTAR Satellite

Daniel Stern earned his AB in Physics at Princeton in 1991, and went on to earn his PhD in Astrophysics from UC Berkeley in 1999. He went straight from Berkeley to JPL, initially as a postdoc and later as a staff scientist. He has worked on multiple missions and mission concepts, including Spitzer, WISE, Euclid, WFIRST, a CubeSAT, a proposed X-ray polarimeter, the two future NASA flagship concepts for the 2030s, the Habitable Exoplanet Imaging Mission (HabEx) and an X-ray mission, Lynx. His main job currently is as the NuSTAR Project Scientist. Scientifically, Dr. Stern's main interests are observational cosmology and extragalactic astrophysics, but he's had a sideline finding the most distant objects of various source classes, including the most distant object, the most distant galaxy, the most distant radio galaxy, the most distant quasar, the most distant galaxy cluster and the most distant supernova. As one might expect, he's a very enthusiastic observer, having logged over 500 nights at telescopes worldwide over the past 20 years.

Estate Sale:

12-inch Meade LX200 classic telescope and Meade Pictor imaging package.
Includes field tripod, wedge, keypad, power supplies and cables, 8x50 and red-dot finder scopes, eyepieces, printed documentation, and various visual and photographic accessories. All items have been stored in a dry and secure location since last used by original owner. Offered as a complete set for $2000.

Technical questions should be directed to Bruce Waddington, bw_msg01@earthlink.net, (949) 939-0063.
For other questions or to make purchase arrangements, please contact Ms. Mary Ann Wood, (562) 417-5242.

Celestron C90 MaksutovTelescope and Losmandy Tripod
Losmandy tripod (no mount) with steel legs and Losmandy dampening paws, $100.
Celestron rubber armored C90 Maksutov with 6X30 finder scope and 11/4" star diagonal, $75.
Scope is clean and in very good condition. Contact Val, (949) 380-1244.

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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
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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	Pauline Acalin	pauline.acalin@gmail.com	617-515-0236
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