SIRIUS ASTRONOMER

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The Newsletter of the Orange County Astronomers

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Pat Knoll created this image of Europa and its shadow transiting Jupiter from his observing site in Kearney Mesa, California (near San Diego). Surface markings on Europa are clearly visible. Images from the rare triple shadow transit earlier this year have yet to show up on OCA's website. They've got to be out there, so get them in!

OCA CLUB MEETING

The free and open club meeting will be held March 13 at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. This month's speaker is Dr. Varoujan Gorjian from JPL. The topic for this month's presentation is "Lifting the Cosmic Veil: Spitzer Observations from Our Own Backyard to the Edge of the Universe."

NEXT MEETINGS: April 10, May 8

STAR PARTIES

The Black Star Canyon site will open on March 14. The Anza site will be open on March 21. 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 March 6. The following class will be held April 3.

GOTO SIG: TBA
Astro-Imagers SIG: Mar. 10, Apr. 14
Remote Telescopes: TBA
Astrophysics SIG: Mar. 20, Apr. 17
Dark Sky Group: TBA

The heavyweight champion of the Cosmos

By Dr. Ethan Siegel

As crazy as it once seemed, we once assumed that the Earth was the largest thing in all the universe. 2,500 years ago, the Greek philosopher Anaxagoras was ridiculed for suggesting that the Sun might be even larger than the Peloponnesus peninsula, about 16% of modern-day Greece. Today, we know that planets are dwarfed by stars, which themselves are bound together by the billions or even trillions into galaxies.

But gravitationally bound structures extend far beyond galaxies, which themselves can bind together into massive clusters across the cosmos. While dark energy may be driving most galaxy clusters apart from one another, preventing our local group from falling into the Virgo Cluster, for example, on occasion, huge galaxy clusters can merge, forming the largest gravitationally bound structures in the universe.

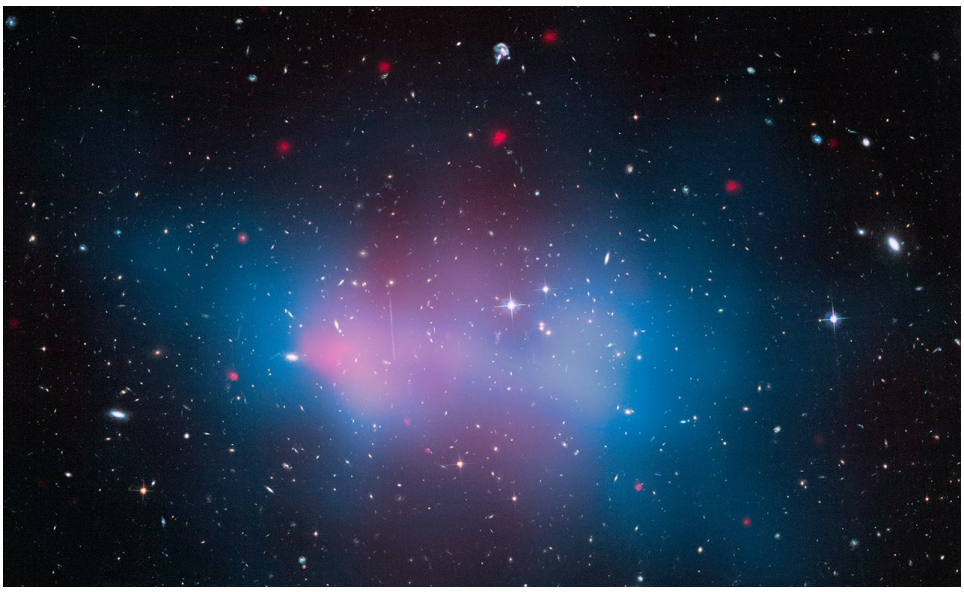


Image credit: NASA, ESA, J. Jee (UC Davis), J. Hughes (Rutgers U.), F. Menanteau (Rutgers U. and UIUC), C. Sifon (Leiden Observatory), R. Mandelbum (Carnegie Mellon U.), L. Barrientos (Universidad Catolica de Chile), and K. Ng (UC Davis). X-rays are shown in pink from Chandra; the overall matter density is shown in blue, from lensing derived from the Hubble space telescope. 10 billion light-years distant, El Gordo is the most massive galaxy cluster ever found.

Take the "El Gordo" galaxy cluster, catalogued as ACT-CL J0102-4915. It's the largest known galaxy cluster in the distant universe. A galaxy like the Milky Way might contain a few hundred billion stars and up to just over a trillion (10^{12}) solar masses worth of matter, the El Gordo cluster has an estimated mass of 3×10^{15} solar masses, or 3,000 times as much as our own galaxy! The way we've figured this out is fascinating. By seeing how the shapes of background galaxies are distorted into more elliptical-than-average shapes along a particular set of axes, we can reconstruct how much mass is present in the cluster: a phenomenon known as weak gravitational lensing.

That reconstruction is shown in blue, but doesn't match up with where the X-rays are, which are shown in pink! This is because, when galaxy clusters collide, the neutral gas inside heats up to emit X-rays, but the individual galaxies (mostly) and dark matter (completely) pass through one another, resulting in a displacement of the cluster's mass from its center. This has been observed before in objects like the Bullet Cluster, but El Gordo is much younger and farther away. At 10 billion light-years distant, the light reaching us now was emitted more than 7 billion years ago, when the universe was less than half its present age.

It's a good thing, too, because about 6 billion years ago, the universe began accelerating, meaning that El Gordo just might be the largest cosmic heavyweight of all. There's still more universe left to explore, but for right now, this is the heavyweight champion of the distant universe!

Learn more about "El Gordo" here: http://www.nasa.gov/press/2014/april/nasa-hubble-team-finds-monster-el-gordo-galaxy-cluster-bigger-than-thought/

El Gordo is certainly huge, but what about really tiny galaxies? Kids can learn about satellite galaxies at NASA's Space Place http://spaceplace.nasa.gov/satellite-galaxies/.

AstroSpace Update

March 2015

Gathered by Don Lynn from NASA and other sources

New exoplanet finds – A team of scientists recently discovered a system of 3 planets orbiting a nearby star called EPIC 201367065. The planets are 1.5-2 times the diameter of Earth. The outermost of the 3 orbits on the edge of the habitable zone, that region where the temperature may allow liquid water. The planets were found in K2 data. K2 is the Kepler planet-finding mission after it was altered to run on only the 2 working reaction wheels, rather than the 3 normally required. The compositions of the newfound planets are not known, but the outermost one is likely rocky, not a gas giant, based on its size. The planets were confirmed using the Infrared Telescope Facility (IRTF) and Keck Telescope in Hawaii and other telescopes. Adaptive optics were used to prove that the host star is a single star, as binary stars can look like planets in Kepler data, so the astronomers wanted to rule that out. Next the team is going to try to measure the atmospheres of the newfound planets. The K2 operating plan requires that the telescope look at the ecliptic (path of the planets around the Sun). That means planets found from K2 observations are in the plane of our solar system planets. Thus an observer on such planets would usually be able to see our planets pass in front of the Sun, as we on Earth are seeing the newfound planets pass in front of their sun.

Red dwarf exoplanets – Red dwarf stars are much smaller and dimmer than our Sun. So the habitable zone for planets of red dwarfs is much closer to the star. So close, in fact, that it is likely that tidal forces from the star's gravity will slow the planet's rotation until one side always faces its sun. This could make most of such a planet too hot or too cold for liquid water, and could even freeze out the atmosphere on the dark side. A new study shows the prospects are not so gloomy. A computer simulation shows that planets with substantial atmospheres so close to a red dwarf would generate enough wind to keep the planet rotating against the tidal forces. This is thought to be why Venus has a day-night cycle, though slow, instead of locking one side to the Sun. However the simulation shows that a far thinner atmosphere than Venus's would also do the trick.

Large Binocular Telescope Interferometer (LBTI), in Arizona, has completed its 1st study of dust in the habitable zone around a star. Dust is a natural byproduct of the planet-formation process, but too much dust can block our view of planets. The LBTI study is looking for opportunities to directly image exoplanets. This study will obtain the best infrared images yet of dust permeating stars's habitable zones. A previous study by the Keck Interferometer did not find stars to be all that dusty. But the LBTI is 10 times more sensitive to dust. The 1st LBTI dust observations were made of a mature Sun-like star called Eta Corvi, known to be quite dusty. LBTI works as intended, and found a surprise: the dust was significantly closer to the star than previously thought, lying between the star and its habitable zone. Previous observations with the Spitzer Space Telescope have estimated the dust to be farther out, based on models of the size of dust grains. LBTI will continue to operate for at least 3 years. One of the project's goals is to find stars 10 times less dusty than our solar system, which would make good candidates for planet imaging.


Large Binocular Telescope Observatory

Ring system – Astronomers have discovered that the ring system that they see eclipse the very young Sun-like star J1407 consists of over 30 rings, each tens of millions of miles (km) in diameter, comprising a system about 200 times the size of Saturn's rings. This is the 1st of its kind outside our Solar System. The system was discovered in 2012. Adaptive optics and Doppler spectroscopy were used to estimate the mass of the ringed object, which is in the range of 10-40 Jupiter masses. Thus it could be either a brown dwarf or a planet. The ring system itself has roughly the Earth's mass in light-obscuring particles. Gaps in the rings indicate that satellites may

have formed. The eclipse lasted for several weeks, but changes on time scales of minutes show fine structures exist. Astronomers expect that the rings will thin over the next several million years and eventually disappear as satellites form from the disk material.

Now you see it, now you don't – Last May I reported here the results from observations by the BICEP2 telescope, located at the South Pole, of the Cosmic Microwave Background. The team concluded that polarization seen in the observations was a result of gravitational waves during Inflation, that time during the 1st fraction of a second after the Big Bang when the expansion of the Universe accelerated wildly. I also reported in June the skepticism of other scientists, who pointed out that the polarization could also happen if you observe through cosmic dust. So the BICEP2 team got together with the Planck team, since the Planck spacecraft had measured over the entire sky, among other things, polarization from cosmic dust (and all sources) at 7 different wavelengths. The combined team results have been announced, that the polarization is mostly explained by dust. If there is any component caused by Inflation, it is too small to distinguish from noise in the currently available observations. There is almost no doubt that Inflation occurred, since there is other evidence of it. Predictions are that the polarization from it are just barely below detection, so slightly less noisy observations should soon be able to find that polarization.

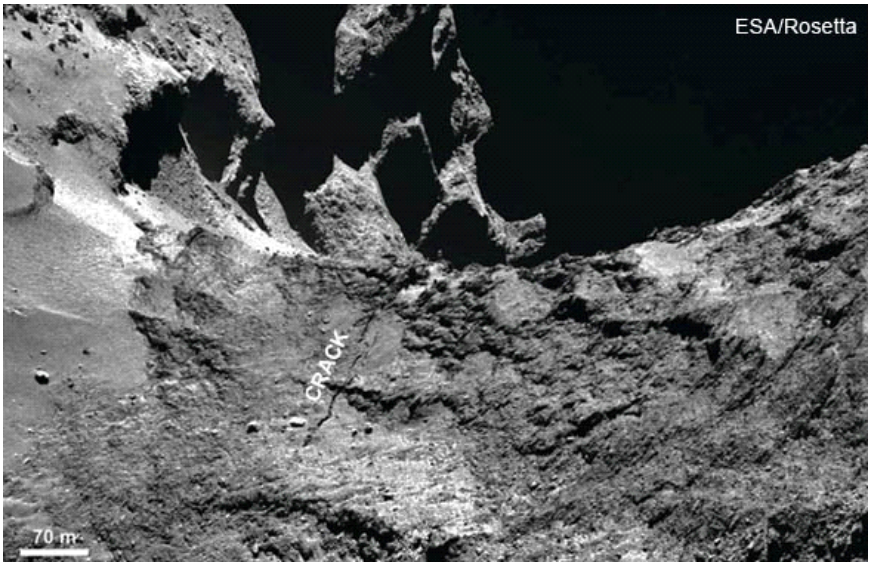
More Planck (Cosmic Microwave Background [CMB] space telescope) – The Planck team has announced more results from analyzing data from the spacecraft. That data includes not only the CMB, but all kinds of dust and gas in our Milky Way and a Universe of galaxy clusters, all in front of the CMB, contaminating observations. By observing at many wavelengths, Planck is sorting out which light comes from which kind of source. A new result is that the Dark Ages of our Universe lasted a little longer than previous estimates. That is, the time between when the CMB was released and when the 1st galaxies lit up with newly formed stars was about 550 million years, not the 300-400 million previously believed. The new data confirms a previous result that dark energy exists. There are now 1500 clusters of galaxies found in Planck data, more than any previous catalog of such clusters. Masses of these clusters were calculated by how much they bent (microwave) light by gravitational lensing. The team was able to separate out non-CMB light, that is, light from intervening objects. What the CMB scientists are throwing away is what other astronomers want from the data: images of those intervening objects.

A fast radio burst has been observed for the 1st time as it was happening. The few previous known fast radio bursts have been found in archived data from radiotelescopes. They last only a few milliseconds and their source is unknown. A team of astronomers in Australia developed a technique to search for these in real time, and it worked. As soon as it was observed, a number of other telescopes around the world, both on the ground and in space, were alerted to make follow-up observations in other wavelengths to see if some sign of the burst persisted. The Swift spacecraft found 2 X-ray sources near the radio burst, but further work showed they were not the radio source. So nothing that could be the source was found. This eliminates several theories (such as gamma-ray bursts and supernovas) of what causes fast radio bursts. The radio data showed the burst was more than 20% circularly polarized, which suggests that the source, whatever it is, is in the vicinity of a magnetic field. Theories that the radio bursts are associated with neutron stars or black holes are still being pursued.

3D galaxy map – Slitless spectroscopy is being used with the Hubble Space Telescope to simultaneously take spectra of every galaxy in given fields of view. The study now has spectra for 20,000 very distant galaxies. The redshift of each spectrum tells us how distant each galaxy is, producing a 3-dimensional map, called 3D-HST. The spectra also indicate the rate of star formation, since that is related to the hydrogen-alpha spectral line. A study of galaxies so distant that we are seeing them as they were when the Universe was half its current age showed that disk galaxies among these were growing by forming stars along their entire pancake-like structures, while elliptical precursors first formed stars in their central bulges before star formation spread outward. 3D-HST was also used to study galaxies without star formation, and some of these were found as far back as only 3 billion years after the Big Bang. This shows that whatever shuts down star formation can act in as little as 3 billion years. 3D-HST will also be used to plan observations by the James Webb Space Telescope, scheduled for launch in 2018, and WFIRST space telescope, scheduled for launch in the early 2020s.

Rosetta (comet mission) – There has been a significant increase in the amount of water emitted by comet 67P/Churyumov-Gerasimenko, the comet about which the Rosetta spacecraft is orbiting. The comet was releasing the equivalent of 40 ounces (1.2 liters) into space every second at the end of last August. That is a 10-fold increase over 3 months previously. The gas flow varies by location and time of the comet's day. The comet nucleus has a duck-like shape. A substantial portion of the measured outgassing

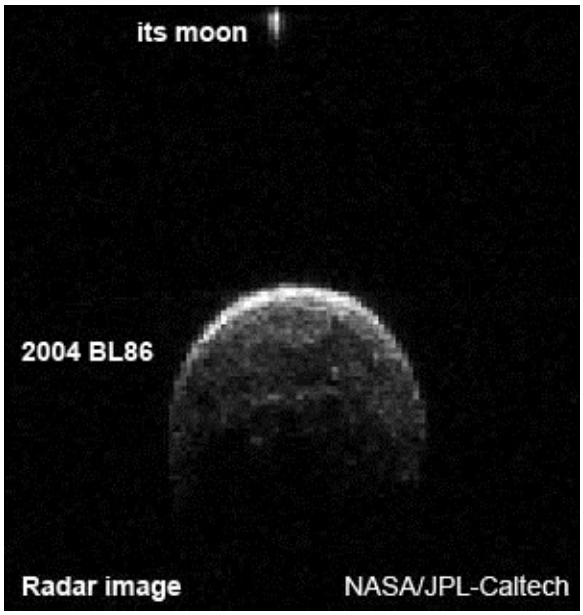
occurred from the neck (of the duck) region during local afternoon. Observations are continuing to search for variability in releasing gas as the comet's distance from the Sun changes. Closest approach to the Sun occurs this coming August. The comet's atmosphere, or coma, is much less homogenous than expected. Spikes in water readings were seen, then a few hours later spikes were seen in carbon dioxide. The water vapor signal is strongest overall. However, there are periods when carbon monoxide and carbon dioxide abundances rival that of water.



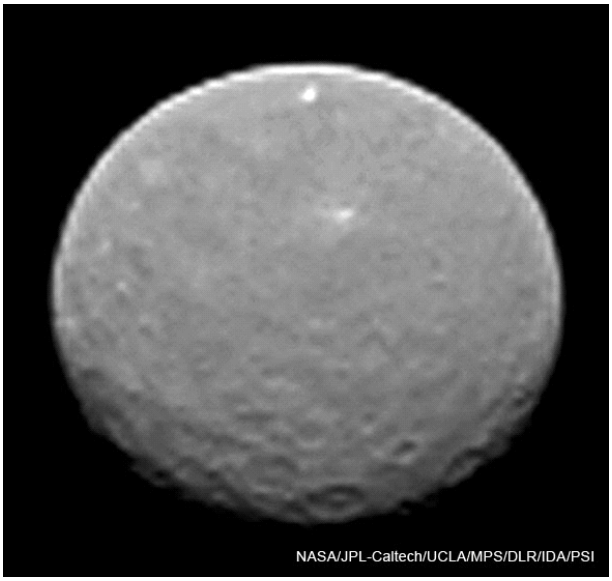
From **Rosetta**'s data, scientists have defined 19 regions on Comet 67P's nucleus according to terrain. They have named the regions for Egyptian deities. The regions fall into 5 categories: dust-covered, brittle material, large-scale depressions, smooth terrains, and consolidated surfaces. No ice has been found exposed, though it is known that water ice and other ices compose much of the interior, but it appears to be buried under dust. The comet is highly porous with a density similar to cork. It is orbited by a cloud of roughly 100,000 lumps of material larger than 2 inches (5 cm) left there by previous passages by the Sun. The region known as Hapi shows evidence of local movement of dust to produce dune-like ripples and wind-tails below boulders. The movement may be caused by escaping gas or electrostatic levitation. Some regions have dust 3-15 ft (1-5 m) deep, which is believed to have been blown into the coma on previous passes by the Sun, then settled back onto the nucleus. The depressions may be caused by collapse after underlying ice sublimed (vaporized). Impact craters appear to be rare. It is estimated that Comet 67P loses over a million tons of material to space every orbit of the Sun. Some of the neck regions have extremely smooth dust with no obvious depressions and few builders. Dozens of pits several hundred yards (m) across are seen, many of which are filled with dust. Scientists suspect they were once sites of vaporizing ices and may become active again when closer to the Sun. Some steep slopes are covered with lumps about 9 ft (3m) across, which are being called goosebumps. They may be primitive material that first formed the comet nucleus, and are now being exposed. Much of the water outgassing is coming from dusty regions. The underside of the duck-like head has a cliff towering about 3000 ft (900 m). On the cliff are linear features both up and down and across. Another region exhibits significant cracks over 100 yards (m) long that may have formed from rotational stress. This has prompted speculation that the comet nucleus may break up. Spectrometer readings have found complex carbon-based molecules. These molecules form only in deep space where cosmic rays and ultraviolet light strike ice-coated dust to form new compounds. Such would form farther from the Sun than it is thought 67P formed.

Yet more **Rosetta**: The spacecraft has begun maneuvers that will take it far above the 16 mile (26 km) altitude at which it has been orbiting, then swoop down to within 3.7 miles (6 km) of the comet nucleus. When close, very fine resolution images and measurements can be made, and instruments can sniff the material hovering about the nucleus. Some close flybys will nearly match the rotation rate, allowing continuous observation of one side of the nucleus for long time periods.

Asteroid 2004 BL86 safely flew past Earth late in January at about 3 times the Moon's distance. Scientists took radar images. Earlier observations had indicated it had a moon, and that moon was imaged by radar. The primary is about 1100 ft (325 m) across, while the moon is about 230 ft (70 m) across. About 16% of asteroids in roughly this size range are binary. Infrared observations made by a telescope in Hawaii during the flyby showed that BL86 is made of basalt, the same material Hawaii is made of.



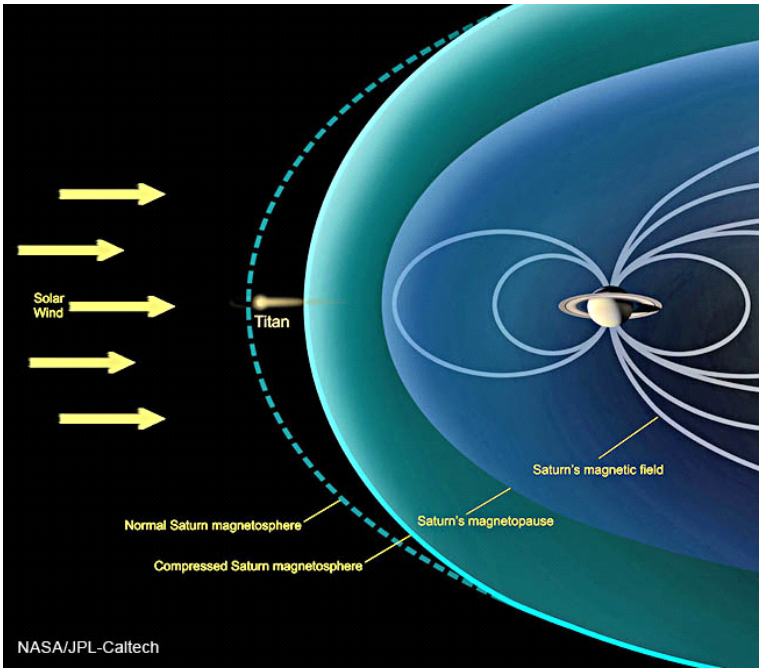
Comet crust – Astronomers experimenting with ice and organic chemicals in the lab may have discovered why comets are encased in a hard outer crust. The researchers showed that fluffy ice on the surface of a comet would crystallize and harden as the comets warms up near the Sun. As the water-ice crystals form, becoming denser and more ordered, other molecules containing carbon would be expelled to the comet's surface. The result is a crunchy comet crust sprinkled with organic dust. The experiments began with amorphous ice, which forms at extremely cold temperatures, around 30° K. Water molecules are haphazardly mixed with the organic molecules. Amorphous ice is light and fluffy and filled with pockets of space. As the material was slowly warmed, mimicking conditions as a comet approaches the Sun, the organics stuck together and were expelled from the ice as it crystallized.



Dawn (asteroid mission) in late January approached Ceres, which is both an asteroid and dwarf planet, close enough that images taken were then better than the best previous Ceres pictures, taken by the Hubble Space Telescope (HST). It appears to have many craters. The HST images showed a bright spot, and the Dawn images showed it is only one of several. Dawn goes into orbit at Ceres March 6, so expect very detailed images of the asteroid soon. Ceres is the largest body in the main asteroid belt between Mars and Jupiter, having a diameter of 590 miles (950 km). Dawn returned more than 30,000 images while it orbited Vesta, its previous asteroid destination.

Early magnetic fields – Less than a dozen objects in the solar system, all of them fairly large, have active magnetic fields today. A new study of the magnetic field trapped in grains of 2 meteorites showed that numerous small bodies also possessed magnetic fields in the 1st tens of millions of years of the solar system's life. The study was done on the Imilac and Esquel meteorites, found in 1822 and 1951 respectively. The researchers looked at the grains of tetrataenite, an iron-nickel alloy. As small bodies formed, they cooled and solidified, trapping the then current magnetic field in the grains. The meteorites cooled slowly, at 2-9 degrees Kelvin per million years. That means they formed inside a larger object that held in the heat of formation, estimated at hundreds of miles (km) in diameter. The magnetic activity had to have lasted tens to hundreds of millions of years after the Solar System's formation, an order of magnitude longer than previous estimates.

New Martian meteorite – A meteorite known as NWA 7034, which was found a few years ago in Morocco, has been found to be like no other meteorite. Like several others, it matches up with Martian material, so was likely blasted off the surface of Mars long ago, and later fell to Earth. But this one is older than any other Martian meteorite, at about 4.4 billion years. And spectroscopically it matches the Martian crust at places where it protrudes through the dust that covers most of Mars. It is a breccia, a mashup of different rock types, including sedimentary components, welded together in a basaltic matrix. All other Martian meteorites are mainly igneous (cooled volcanic material).



Solar wind at Titan – Researchers studying Cassini data have observed that Saturn's largest moon Titan behaves much like Venus, Mars or a comet when hit by the solar wind. This suggests that unmagnetized bodies like Titan interact with the solar wind in the same basic ways, regardless of their nature or distance from the Sun. Titan spends about 95% of the time within Saturn's magnetosphere, out of the direct solar wind. But in late 2013 Titan happened to be on the sunward side of Saturn when a powerful outburst of solar activity arrived and squashed the magnetosphere inside the orbit of Titan. It was the only time during its mission that Cassini flew by Titan while it was outside the magnetosphere. When so exposed, the solar wind was found to drape

around Titan, interacting directly with its atmosphere, as previous observations have found at Mars and Venus (which have no magnetospheres).

Magellanic Clouds (neighboring galaxies) – A new study shows these Clouds are much bigger than astronomers calculated and also have nonuniform structure at their outer edges, hinting at a complex field of debris left over from their formation and interaction. The new survey is called SMASH (Survey of the MAgellanic Stellar History) and used various telescopes including the 4-meter Blanco Telescope in Chile. The astronomers identified stars belonging to the Large Cloud (LMC) at angular distances up to 20° away, corresponding to 55,000 light-years. This was done using a new wide angle camera called DECam on the Blanco Telescope. The team is also exploring the Magellanic Stream, a gaseous structure that connects the 2 clouds and extends in front and behind them. The Stream was 1st detected with radiotelescopes more than 30 years ago, and indicates that the 2 galaxies are interacting with each other and with our Milky Way. Astronomers hope to find stars in the Stream with SMASH, since only gas has been previously found.

Binary black holes – When galaxies merge, astronomers have predicted that the supermassive black holes at their centers will spiral in until they merge into a bigger black hole. But black hole pairs spiraling in have been difficult to find. There is plenty of circumstantial evidence of such black hole pairs, but little conclusive evidence. The best candidate is called OJ 287, which produces a pair of optical outbursts every 12 years, which is probably the orbital period of the pair. OJ 287 has been found in archival pictures as far back as 1887. Astronomers speculate that the double burst is caused by a supermassive black hole punching through the accretion disk around the other. An even better candidate has just been found, a quasar called PG 1302-102, which pulsates with a period of 5 years. The discovery team has been examining archived data to find periodic changes in quasar brightness among the random outbursts that quasars typically produce. The team found 20 periodic quasars (out of 247,000 quasars searched), which they believe to be closely-orbiting black hole binaries. This is about the expected theoretical fraction of quasars expected to be binary. Only the best candidate has so far been examined carefully, and that is PG 1302-102. The combined mass of this pair was determined to be a few hundred million solar masses. They are expected to merge in a few hundred thousand to a couple million years.

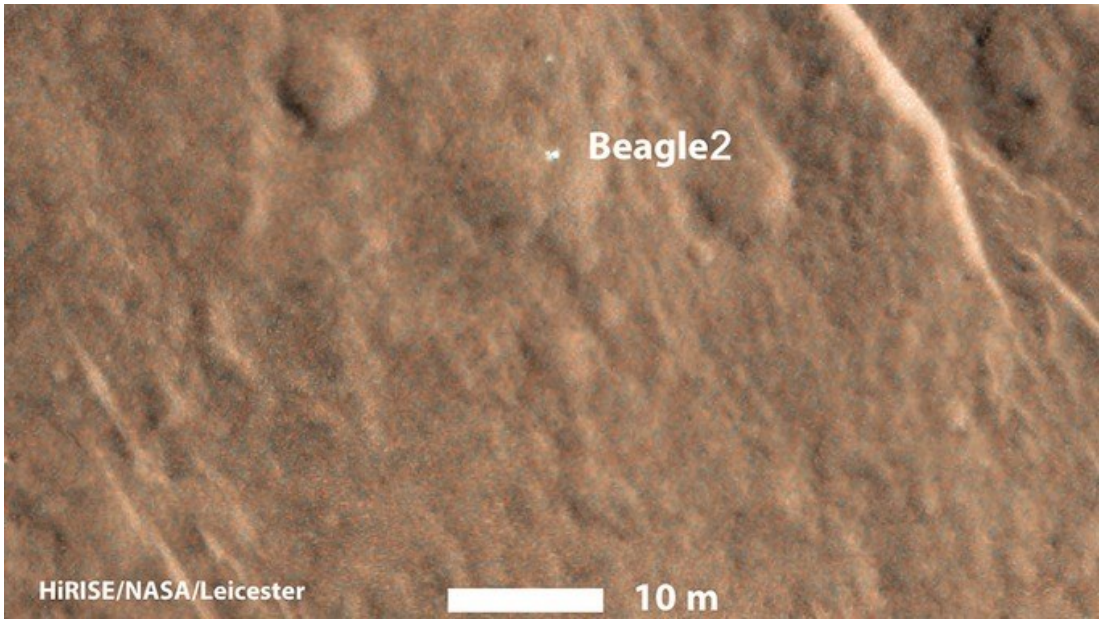
Black hole dining – Astronomers at McDonald Observatory were looking for supernovas when in 2009 they spotted a new point of light that, with continued observation, did not behave like a supernova, as far as its light curve and spectra. They then ruled out a neutron star merger and a gamma-ray burst. Finally they concluded the only explanation that fit the observations was that a distant black hole tore apart a star that ventured too close. So much material was falling into the black hole that the Eddington Limit was exceeded, which is where outward pressure from the light generated keeps further material from falling in. Basically, the black hole choked on the star. The researchers estimated the black hole's size to be about 1 million solar masses. The star itself was roughly Sun sized. Before they knew what the object was, astronomers nicknamed it Dougie, after a character in the cartoon South Park.

Eta Carinae is known to be a binary star in which the 2 components follow an elongated orbit that takes 5.5 years. When the stars are at their closest, they produce a strong X-ray outburst. Both stars have dense stellar winds. A new computer simulation suggests that the secondary star's flow carves out a cavity in the primary's slower, denser wind. When closest to each other, the 2 flows collide violently, creating a shock boundary that heats the gas to tens of millions of degrees, hot enough to generate the X-rays. The Swift spacecraft observed the most recent X-ray flareup last July. It was stronger than previous outbursts, and dropped off after the outburst differently. So one of the stars's winds must have changed since previous outbursts. The helium spectral lines have remained unchanged, and they are known to be generated in the primary's stellar wind, so the conclusion is that the secondary's wind changed.

Supernova map – About 340 years ago a supernova was observed to explode in Cassiopeia. The remnant of exploded material is known as Cassiopeia A. Taking spectra of all points of the remnant has allowed determining the redshift or blueshift, and therefore velocity away from or toward us. The distance away or toward us from the explosion point is proportional to the velocity. So we now have the information to make a 3D map of the remnant. It shows the remnant to be about a half dozen massive cavities, or bubbles. Scientists are studying the map to determine exactly what blew up and how.

New object type – Volunteers using the web-based Milky Way Project brought to the attention of researchers a new type of object being called "yellowballs". The images for the project were taken in infrared, and various wavelengths of infrared are synthetically colored with visible colors. The new objects are colored yellow in this process, hence the name, though the actual objects are not any

visible color. Astronomers determined that yellowballs are a phase of massive star formation. They are several hundred to thousands of times the size of our Solar System. The volunteers were trained to look for (synthetically) green bubbles that newborn stars create as they blow out cavities in their surroundings. The yellowballs are an earlier phase, before the bubbles are produced. More than 900 yellowballs have been found so far. The next step is to determine if yellowballs tend to cluster near older green bubbles. This would support the theory that shocks from star formation hitting surrounding gas start further generations of star formation.



Beagle 2 (Mars mission lost in 2003) has been found in images from the Mars Reconnaissance Orbiter. It apparently soft landed and at least partially deployed. It had been feared Beagle 2 had crashed, since radio contact was lost before it was to have landed. The spacecraft hitched a ride on the same rocket that delivered the long-lived highly successful Mars Express orbiter. Objects were found with the correct size, shape, color and relative location to be the lander, its rear cover and drogue and main parachutes. They are within the expected landing area, about 3 miles (5 km) from its center.

Instant AstroSpace Updates

Future supernova – Observations made by the Very Large Telescope in Chile of a planetary nebula known as Henize 2-428 show that it contains a pair of white dwarf stars, closely orbiting each other every 4.2 hours, each with a mass a little less than our Sun. They are expected to slowly draw closer and merge into a single star in about 700 million years, which will cause a Type Ia supernova and destroy the combination.

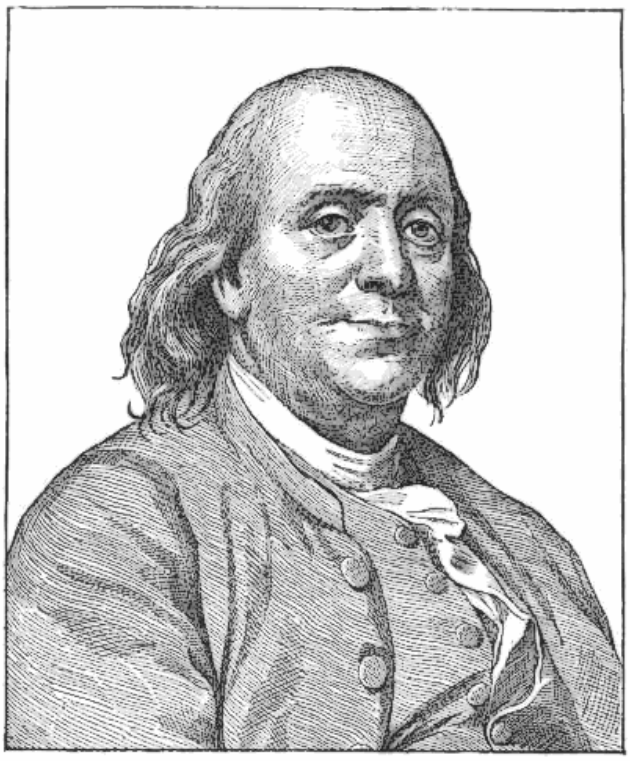
It was announced that both Boeing and SpaceX will have rockets ready to **launch astronauts** to the International Space Station in 2017, after 6 years of the U.S. renting seats in Russian rockets.

A SpaceX **Dragon** spacecraft that brought cargo up to the International Space Station has returned to Earth with nearly 2 tons of 3-D printed parts (testing manufacturing in space), and samples, hardware and data from microgravity experiments, including ones to understand the disease cystic fibrosis. Because of its heat shield, Dragon is the only space station cargo spacecraft able to return to Earth a significant amount of cargo (the other cargo craft burn up on return).

Daylight Saving Time

By Jon Wilson

(This article first appeared in the April 2014 issue of the New Pacific Stargazer. Material used via prior agreement with the Western Amateur Astronomers.



It's astonishing that one man could do so much. He was a member of the American Philosophical Society and participated in observing the Transit of Venus on June 3, 1769. These observations occurred along the East Coast of the British Colonies. He studied electricity and its characteristics. In 1770, he mapped an area of the Atlantic Ocean where currents permitted ships to travel faster when sailing East, and labeled it the "gulf stream." In addition to witnessing early manned balloon flights in 1783, during his stint as the U.S. Minister to France, he's also credited with the creation of bifocal glasses. This astonishing man is also known for creating the lending library, the lightning rod, a new type of cast iron stove, and the glass harmonica. But, Benjamin Franklin, for all his inventiveness, his scientific investigations, his publications, is least known for inventing Daylight Saving Time.

One of our most beloved Founding Fathers conceived the idea of the "saving daylight" as early as 1784, during his time in France. The idea was to conserve the use of candle wax (tallow) a common element in candles used to illuminate the interiors of homes, taverns, and major structures of the time. Yet, some sources vary on this tale, stating that the concept of Daylight Saving Time was initially conceived in or around 1895 by New Zealander George Vernon Hudson. However, there's little doubt that the modern Daylight Saving Time (DST) began to take off in the early 20th Century. The idea of the modern DST began in Great Britain with a builder from Chelsea, named William Willett, in 1907. He proposed that clocks be set 80 minutes ahead during the Spring and Summer months. The following year, this proposal was championed by Sir Robert Pearce with a bill in the House of Commons. After a lengthy study, the measure to advance clocks by one hour was adopted on May 17, 1916.

After the outbreak of World War I., the United States began looking at Daylight Saving Time. This resulted in a national campaign in 1916. By 1917, Congress approved DST, which would run from March 31 to October 27, 1918, and again on March 30th, of 1919. However, by the summer of 1919 there were so many objections from farmers that Congress repealed the act. Then, in 1966, Congress re-established DST under the *Uniform Time Act of 1966*. Ever since then, Congress has amended this act at least five times! Is it really necessary? As amateur astronomers, we all know how it affects our hobby.

Here in the U.S., if we have celestial objects with coordinates in Universal Time (UT) then we have a loss of 1 hour from our relative observing longitude with respect to the Prime Meridian. What many forget is DST is still practiced in Great Britain. They *advance* their clocks one hour, and they call it British Summer Time (BST). So, how do we adjust?

Let's use the West Coast as an example. With respect to the Prime Meridian, the DST difference is minus 7 hours, and not eight. With Great Britain practicing British Summer Time (their version of DST), their clocks are set one hour ahead; we're back to an 8-hour difference between the West Coast and the Prime Meridian.

As inconvenient as DST is, the effect on our hobby of astronomy is minimal. Yet, the question remains: do we still need Daylight Saving Time? Probably not, but until it's repealed, we'll all have to wrestle with my least favorite of Benjamin Franklin's inventions.

Day Hike at Anza

By Russell Sipe

(taken from content first posted to the OCA Website in 1998)

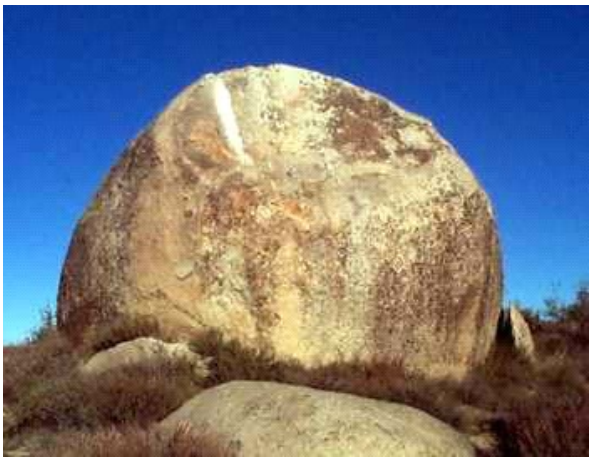
Taking a walk along the roads around the OCA site can be a nice diversion during the day. The dirt road leading east from the Upper Pad Area makes for a pleasant walk. One day I decided to take a walk northeast from the OCA site. Warning: The access gate to the area in question is posted "No Trespassing".

Bush Pine -- About a quarter mile from the site this fascinating old pine tree can be found. The odd bush shape of the tree, some 40 feet high, seems to suggest that something, perhaps lightning, has chopped off the top half of the tree, although no such damage is evident on the trunk. The photo looks to the west.

Old Moon -- An old moon can been seen in this shot taken through the branches of the Bush Pine.

The Grass Is Greener -- The ground underneath Bush Pine is a mini oasis of cool green grass. Watch out for snakes in the grass. (grin)

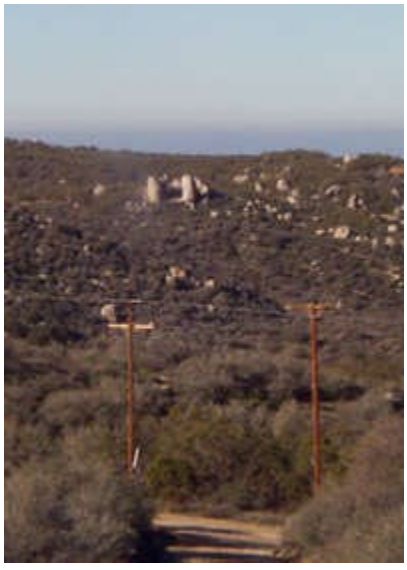
Boulder Field -- Another quarter mile or so down the trail a boulder field rises on the north side of the path.



The Bowling Ball -- The centerpiece of the boulder field looks like a giant bowling ball in this photo. At the lower right corner you can make out the "Chip off the Old Bowling Ball"

The Chip Off the Old Bowling Ball --The entire boulder field is made up of granite boulders and decomposed granite soil. There are many examples of weather erosion on the boulders. This is one of the more dramatic.

The Fort --This outcropping is west of the OCA property as seen from road boarding the north side of the property. I call it "The Fort".



Close Up of The Fort

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