SIRIUS ASTRONOMER

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The Newsletter of the Orange County Astronomers

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Monsignor Ron Royer, who was active in the club before his retirement, created this set of images of the April 15th lunar eclipse from his home in Springville, California. For those of you who may have missed it, the next total lunar eclipse will be on October 8th of this year.

OCA CLUB MEETING

The free and open club meeting will be held May 9 at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. This month's speaker is yet to be announced at press time.

NEXT MEETINGS: June 13, July 11

STAR PARTIES

The Black Star Canyon site will open on May 24. The Anza site will be open on May 24. 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 May 2. The following class will be held June 6.

GOTO SIG: TBA
Astro-Imagers SIG: May 13, June 10
Remote Telescopes: TBA
Astrophysics SIG: May 16, Jun. 20
Dark Sky Group: TBA

The Power of the Sun's Engines

By Dr. Ethan Siegel

Here on Earth, the sun provides us with the vast majority of our energy, striking the top of the atmosphere with up to 1,000 Watts of power per square meter, albeit highly dependent on the sunlight's angle-of-incidence. But remember that the sun is a whopping 150 million kilometers away, and sends an equal amount of radiation in all directions; the Earth-facing direction is nothing special. Even considering sunspots, solar flares, and long-and-short term variations in solar irradiance, the sun's energy output is always constant to about one-part-in-1,000. All told, our parent star consistently outputs an estimated 4×10^{26} Watts of power; one *second* of the sun's emissions could power all the world's energy needs for over 700,000 years.

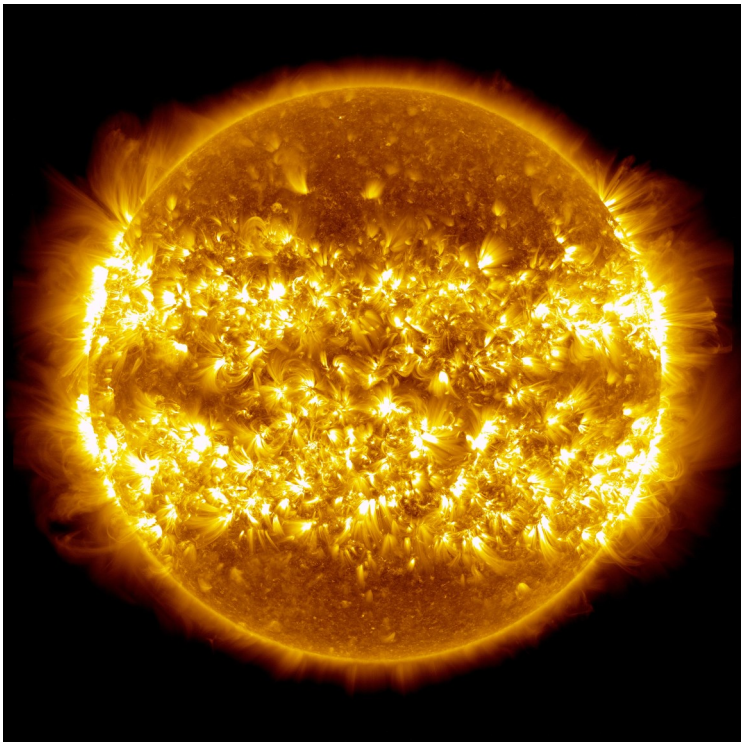


Image credit: composite of 25 images of the sun, showing solar outburst/activity over a 365 day period; NASA / Solar Dynamics Observatory / Atmospheric Imaging Assembly / S. Wiessinger; post-processing by E. Siegel.

That's a literally astronomical amount of energy, and it comes about thanks to the hugeness of the sun. With a radius of 700,000 kilometers, it would take 109 Earths, lined up from end-to-end, just to go across the diameter of the sun once. Unlike our Earth, however, the sun is made up of around 70% hydrogen by mass, and it's the individual protons — or the nuclei of hydrogen atoms — that fuse together, eventually becoming helium-4 and releasing a tremendous amount of energy. All told, for every four protons that wind up becoming helium-4, a tiny bit of mass — just 0.7% of the original amount — gets converted into energy by $E=mc^2$, and that's where the sun's power originates.

You'd be correct in thinking that fusing $\sim 4 \times 10^{38}$ protons-per-second gives off a tremendous amount of energy, but remember that nuclear fusion occurs in a *huge* region of the sun: about the innermost quarter (in radius) is where 99% of it is actively taking place. So there might be 4×10^{26} Watts of power put out, but that's spread out over 2.2×10^{25} cubic meters, meaning the sun's energy output *per-unit-volume* is just 18 W / m^3. Compare this to the average human being, whose basal metabolic rate is equivalent to around 100 Watts, yet takes up just 0.06 cubic meters of space. In other words, **you emit 100 times as much energy-per-unit-volume as the sun**! It's only because the sun is so large and massive that its power is so great.

It's this slow process, releasing huge amounts of energy *per reaction* over an incredibly large volume, that has powered life on our world throughout its entire history. It may not appear so impressive if you look at just a tiny region, but — at least for our sun — that huge size really adds up!

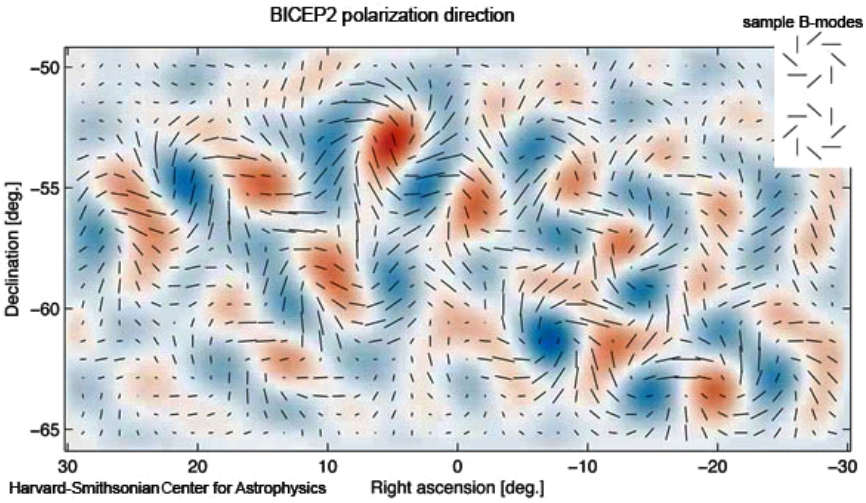
Check out these "10 Need-to-Know Things About the Sun": http://solarsystem.nasa.gov/planets/profile.cfm?Object=Sun.

Kids can learn more about an intriguing solar mystery at NASA's Space Place: http://spaceplace.nasa.gov/sun-corona.

AstroSpace Update

May 2014

Gathered by Don Lynn from NASA and other sources



Gravitational Waves & Inflation – Astronomers using the BICEP2 telescope at the South Pole have announced that they found in measurements of polarization of the Cosmic Microwave Background (CMB) evidence of 1) rampant gravitational waves (ripples in the fabric of spacetime) in the early Universe, and 2) cosmic inflation. The CMB is the radiation released 380,000 years after the Big Bang when the Universe cooled enough to allow light to travel freely across the cosmos. BICEP2 is a telescope optimized to detect polarization (preferred direction of light wave vibration) in the CMB. It uses custom-built detectors that are kept at a fraction of a degree above absolute zero, at the temperature where the detectors become superconducting. Thus any energy focused on a pixel of the detectors will cause loss of superconductivity, amplifying the weak signals. The CMB is a nearly uniform radio noise, and the signal that scientists want to measure consists of variations of about 1 part in 100,000, so it is difficult to detect. But the polarization of that signal is more than 100 times weaker, so it has taken decades of effort to measure the polarization. Several conditions could polarize the CMB, but only a couple of them can polarize it in what is called the B-mode, a sort of spiral pattern. The BICEP2 work is only the 2nd successful detection of B-mode polarization, and the 1st detection (by the South Pole Telescope, the next-door neighbor of the BICEP2 telescope) was found to be the result of the other cause (gravitational lensing), not gravitational waves. The new observation was made over larger angles than the 1st detection, since gravitational waves should cause stronger polarization at larger angles. This is probably the most direct detection of gravitational waves, though they have been seen through indirect methods, such as the loss of energy of closely orbiting neutron stars that matched the theoretical energy of gravitational waves. The BICEP2 measurements found exactly the polarization patterns that are predicted by inflation theory, though the strength found was greater than expected. Inflation theory says that during the 1st tiniest fraction of a second after the Big Bang, the Universe underwent expansion at a rate far in excess of what the Big Bang yielded. During the inflation, the Universe would have expanded by at least a factor of 10 septillion times (10,000,000,000,000,000,000,000,000). Because the force that caused inflation has not been found, inflation needs all the observational support that it can get. The BICEP2 observations give much support. Such controversial results will require confirmation by other observations. This may come soon, because the Planck spacecraft has been measuring polarization in the CMB for years, and analysis of its observations are expected sometime this year. At least a dozen other teams of scientists are known to be trying to measure polarization in the CMB. Experts are predicting that either proof of gravitational waves or inflation might earn a Nobel Prize.

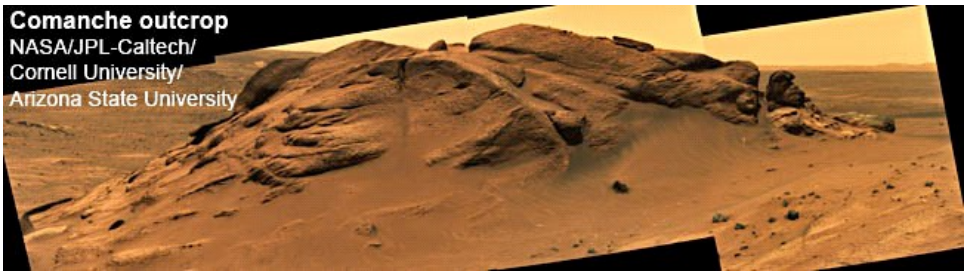
Possible dwarf planet – Astronomers announced the discovery of a very distant object in the Solar System, at 83 AU (where 1 AU is the Earth's distance from the Sun). It has the largest perihelion (nearest point to the Sun) of any known object in the Solar System. Its temporary name is 2012 VP113. The letters are assigned in order of discovery, but some astronomers are joking that it was named after VP Biden. Based on its brightness, VP113 is estimated to be 280 miles (450 km) in diameter. If it is made mostly of ice, this diameter would be large enough for its gravity to pull it into a spherical shape (if rock, then it would have to be larger to be spherical). Being spherical would qualify VP113 to be a dwarf planet. But further observations are needed to establish this. Its orbit is like Sedna, the previous perihelion record holder, in that it is very elongated, traveling out to several hundred AU and inward to 80 AU (76 for Sedna). The closest approach (to the Sun or Earth) for these 2 bodies is far beyond almost every object in the Kuiper Belt (the icy asteroids beyond Neptune). Jan Oort predicted long ago that there had to be a cloud of cometary objects far beyond the known objects of the Solar System, in order to explain the source of long-period comets that fall in toward the Sun from very far away. But we still don't have the technology to discover any objects while they are still in the Oort Cloud. Theoretical work shows that the Oort Cloud should be far beyond where Sedna and VP113 have been found. But some are calling these 2 "the inner Oort Cloud". On the basis of having found 2 objects in this region, and having searched only a tiny fraction of the sky, the discovery team predicted that a

thorough search would find 900 dwarf planets in this inner Oort Cloud. Of course basing an estimate on so few known objects is likely to come up with a wild number. So the obvious questions are: how did these 2 objects form where we found them? Or did they form elsewhere? In which case, how did they move to where we found them? No one has come up with a convincing answer as to how they formed there, particularly not with highly elongated orbits. The obvious answer as to how they moved there (and acquired elongated orbits) is that some massive body, somewhere along their current orbits, deflected them. But the survey reported here last month shows that there are no massive bodies orbiting anywhere in the Solar System out to thousands of AU, far beyond where they would be needed to deflect Sedna and VP113. The announcement of VP113 also mentioned that there are 10 other objects, all in the Kuiper Belt, and therefore much closer to the Sun than VP113, that have elongated orbits, with the elongation on the same side of the Sun as Sedna and VP113's elongation. This supports the theory that all were deflected by the same object. Yet, there does not seem to be such a deflecting object. A lot more work is needed to understand this inner Oort Cloud.

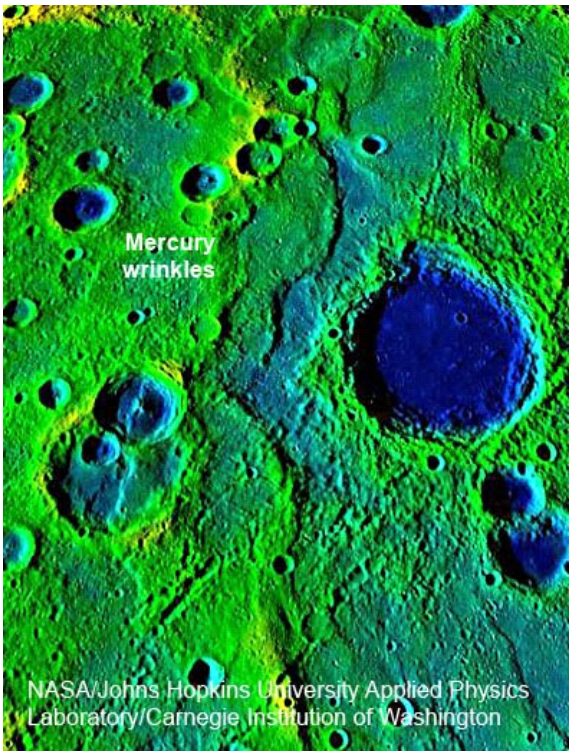
Asteroid rings – Observations made at several sites in South America of the asteroid Chariklo passing in front of (occulting) a star showed that the asteroid is surrounded by 2 dense and narrow rings. In our Solar System, only the 4 gas giant planets were known to have rings. The origin of the rings is not known, but it is possible that they are the result of a collision that created a disk of debris. Chariklo is the largest known member of the Centaurs, those asteroids or comets orbiting among the outer planets (Jupiter to Neptune). The rings are 4 and 2 miles (7 and 3 km) wide and are separated by 5 ½ miles (9 km). Chariklo is about 160 miles (250 km) in diameter. In order for such rings to persist, they would have to have shepherding moons. No moons of Chariklo have been found, but they may be too small to detect with current technology.

Another ocean – Gravity measurements by the Cassini spacecraft and the Deep Space Network here on Earth doing precision tracking of Cassini have found a dense layer covering much of the southern parts of Saturn's moon Enceladus, which has been interpreted as a liquid water ocean. It lies under about 19-25 miles (30-40 km) of solid ice, and the liquid is about 6 miles (10 km) thick. The subsurface ocean would make Enceladus among the most likely places in our Solar System to host microscopic life. It is not known whether the cracks on the surface that are spouting water geysers reach down to the ocean, or whether the geysers are fed by smaller pockets of water closer to the surface. It is thought that the ocean is kept warm enough to remain liquid by tidal flexures of the moon.

Titan (Saturn's huge moon) is covered over its far northern regions with vast lakes of liquid methane, and repeated radar images of the lakes have found them extremely smooth. Since there are winds at the surface, why aren't the lakes rippled? A study of the last 2 years of radar measurements has now found what appear to be ripples, estimated at a mere inch (2 cm) in height. Since winds should be picking up due to change in seasons, the ripples may have been too small to see in the past. The observations could also be caused by uneven mud flats by the lakes, so further observations are needed to confirm that lake ripples have been found.



Martian lake – Mars rover Spirit was landed in Gusev Crater, in part because the crater appeared to have long ago held a lake. Although the rover found evidence of alteration of rocks by past water, it did not find lake sediments. A rock outcrop called Comanche studied by the rover was found to be rich in magnesium-iron carbonate minerals, which were originally attributed to hydrothermal (hot springs) activity. A team of scientists has re-examined the Comanche observations, and come to a different conclusion. The outcrop probably started out as a volcanic ash deposit known as tephra. This material came from explosive eruptions somewhere around Gusev Crater. There is a huge valley that breaches Gusev's southern rim, indicating that some time in the past floodwaters poured into Gusev Crater. The new study showed that this flood would have ponded in the crater long enough to alter the tephra, producing briny solutions. Then the brines would evaporate, leaving behind the carbonate minerals that Spirit found. The floods probably occurred more than once. It is thought that minerals like those at Comanche covered much of the floor of Gusev, but most have eroded from wind, leaving only the hardest outcrops, like Comanche. So probably the hoped-for ancient lake in Gusev did indeed happen, perhaps many times.



Shrinking Mercury – A study of 5934 features found in the global maps of Mercury made by the Messenger spacecraft has determined that when the planet cooled in the distant past, it shrunk in radius by about 4.4 miles (7 km). The features studied included curving cliff-like scarps and wrinkle ridges, which ranged from 5-560 miles (9-900 km) long. Unlike Earth, with its numerous tectonic plates, Mercury has a single rigid top rocky layer that was distorted when the underlying material cooled and contracted. A previous study using far less complete data, had found the radius had shrunk by ½ to 2 miles (0.8-3 km). Yet computer simulation of planet cooling had predicted radial shrinkage of 3-6 miles (5-10 km), and this disagreement had long perplexed planetary scientists. The new results agree beautifully with the computer simulations.

Explosive Mercury – On Earth, volcanic explosions like the one that tore apart Mount St. Helens happen because our planet's interior is rich in volatiles (water, carbon dioxide, etc with relatively low boiling points). As lava rises, volatiles dissolved within it change to gas, possibly blowing off the top of the volcano. Mercury, however, should have lost most of its volatiles during formation of the planet, so should not have experienced much explosive volcanism. But a new study of 51 pyroclastic sites (the aftermath of explosive volcanism) revealed that some of them are far older than others, implying explosive volcanism persisted over an appreciable period of Mercury's history. Also, recent observations have found sulfur, potassium and sodium on Mercury's surface, and these would be volatiles at volcanic temperatures. So the theories of Mercury's formation need to be revised to allow volatiles to persist.

Moon's age – A team of scientists determined that the Moon formed about 95 million years after the Earth, though that measurement could be in error as much as 32 million years. It is believed that the Moon formed from debris after a small planet collided with Earth, but the time when that happened has been difficult to pin down. The team was doing computer simulations of planet formation, and noted that the amount of material added to the Earth after the Moon formed was highly dependent on the date of the Moon being formed. That added material has been previously measured, since it affects the amount of iron-associating elements in the Earth, which can be measured. This allowed the new study to determine the date of the collision that formed the Moon. There have been other attempts to establish the date of the Moon's formation, using radioactive dating techniques, but these have produced differing results. This new study should help determine which of the radioactive dating techniques for the Moon are accurate.

Planet/star interaction – Hot young stars are wildly active, emitting giant violent flares, and glowing in X-rays 1000 times brighter than middle-aged stars. This activity is believed to be caused by powerful magnetic fields driven be rapid star rotation. Young star ages can be judged by how much the activity has calmed. It has been theorized that young stars with hot Jupiters (gas giant planets orbiting closely and therefore heated strongly by the star) would slow their rotation speed more slowly than other stars, and might therefore retain their wild activity longer. Attempts to observe this theory in action have not been successful because current methods of finding planets tend to not work with active stars, and there is no good way, other than activity, to tell the age of a young star. A new study avoided these difficulties by studying only binary stars where one of the pair has a known planet. If such a star with a hot Jupiter gives off more X-ray emission than its twin, which should be the same age, then the hot Jupiter must be delaying the drop in activity. Stars with very close hot Jupiters were indeed found much brighter in X-rays than their twins. Pairing with more distant or less massive planets resembled their twins in X-rays. It appears that close massive planets are tidally pulling their stars to maintain high rotation speeds for much longer than normal.

Dark matter – A new study of gamma rays from the center of our Milky Way galaxy makes the strongest case to date that some of that emission is produced by dark matter. Scientists used data from the Fermi Gamma-ray Space Telescope to develop new maps of the gamma rays from the galaxy center, and showed that there is more high-energy gamma radiation than can be explained by known sources of gamma rays; further the excess is consistent with theoretical predictions of what dark matter particles should produce when they collide with each other (an extremely rare occurrence, since dark matter does not interact much with anything, including itself). The excess appears most prominent at energies between 1-3 billion electron volts and extends outward at least 5000

light-years from the center. If the mass of the particles of dark matter lie in the range of 31-40 GeV, then their annihilation to gamma rays would fit the spectrum, symmetry and brightness of the excess measured. The galactic center teems with gamma-ray sources, including interacting binary stars, isolated pulsars, supernova remnants and particles colliding with interstellar gas. It's also where theory the greatest concentration of dark matter is expected. Because dark matter is controversial, the new findings will have to be verified by further work. A study released in February reported a slight excess in gamma rays from dwarf galaxies, though it was not strong enough to claim it was from dark matter.

Tendrils – It has been known for some time now that the galaxies of the Universe are generally arranged along a web of strands, leaving voids between them. Extremely few galaxies were known to lie within the voids. A new study, using data from the GAMA survey found that those few galaxies within voids also show a structure; they lie along small strings of just a few galaxies that penetrate into the voids. The newly found structures are being called "tendrils".

Hubble Space Telescope has measured the mass of the largest known galaxy cluster in the distant Universe, designated as ACT-CL J0102-4915, and found it to be as much as 3 quadrillion times the mass of the Sun. This is 43% more massive than a previous estimate. The cluster's light took 9.7 billion years to reach us, so we are seeing it as it was 9.7 billion years ago. It has been nicknamed "El Gordo", which translated to "the fat one". The new measurement was made by seeing how much the cluster's gravity warps images of galaxies behind it. Though comparable galaxies are found in nearby parts of the Universe, such as the Bullet cluster, nothing like this has been seen to exist so far away and so far back in time. El Gordo looked as if it might have been the result of a collision between a pair of galaxy clusters, and it was thought that this collision might affect the accuracy of previous methods of measuring its mass. This prompted the new mass measurement by a different technique than had been used before on El Gordo.

More Hubble – A new technique has been developed, called spatial scanning, that has resulted in measuring star positions accurate to 1/1000 of a pixel. The telescope scans across the target, taking thousands of separate images, and those are computer processed to calculate the position. The result is that accurate parallax (distance) measurements can now be made out to much greater distances than before, to thousands of light-years. The technique is being applied to the nearest Cepheid variable stars, which are the basis of nearly all cosmic distance measurements. When complete, this should improve the accuracy of all cosmic distances, and improve measurement of the expansion rate of the Universe.

Black hole growth – A new study using data form WISE (infrared space telescope) has turned up what might be the cosmic seeds from which supermassive black holes will sprout. Black holes are almost all either the size of a collapsed star (which is how they formed) or millions of times larger, found at the centers of galaxies. No means is known how supermassive ones could directly form, so they must have grown from small black holes. How they grew is the subject of much debate. The new study looked at dwarf galaxies to try to find black holes at their centers. Dwarf galaxies of today are thought to resemble the types of galaxies that existed in the early history of the Universe, since larger galaxies had not had time to develop yet. Since infrared light penetrates dusty galaxies better than visible light, the new study chose infrared. The researchers found dwarf galaxies have black holes 1000-10,000 times the mass of the Sun, larger than expected. The leading theories of how black holes grow are 1) through collisions of black holes, or 2) through pulling in ordinary matter. It is believed that the dwarf galaxies studied have not undergone enough collision to have grown their black holes as large as seen, so this argues against the collision theory.

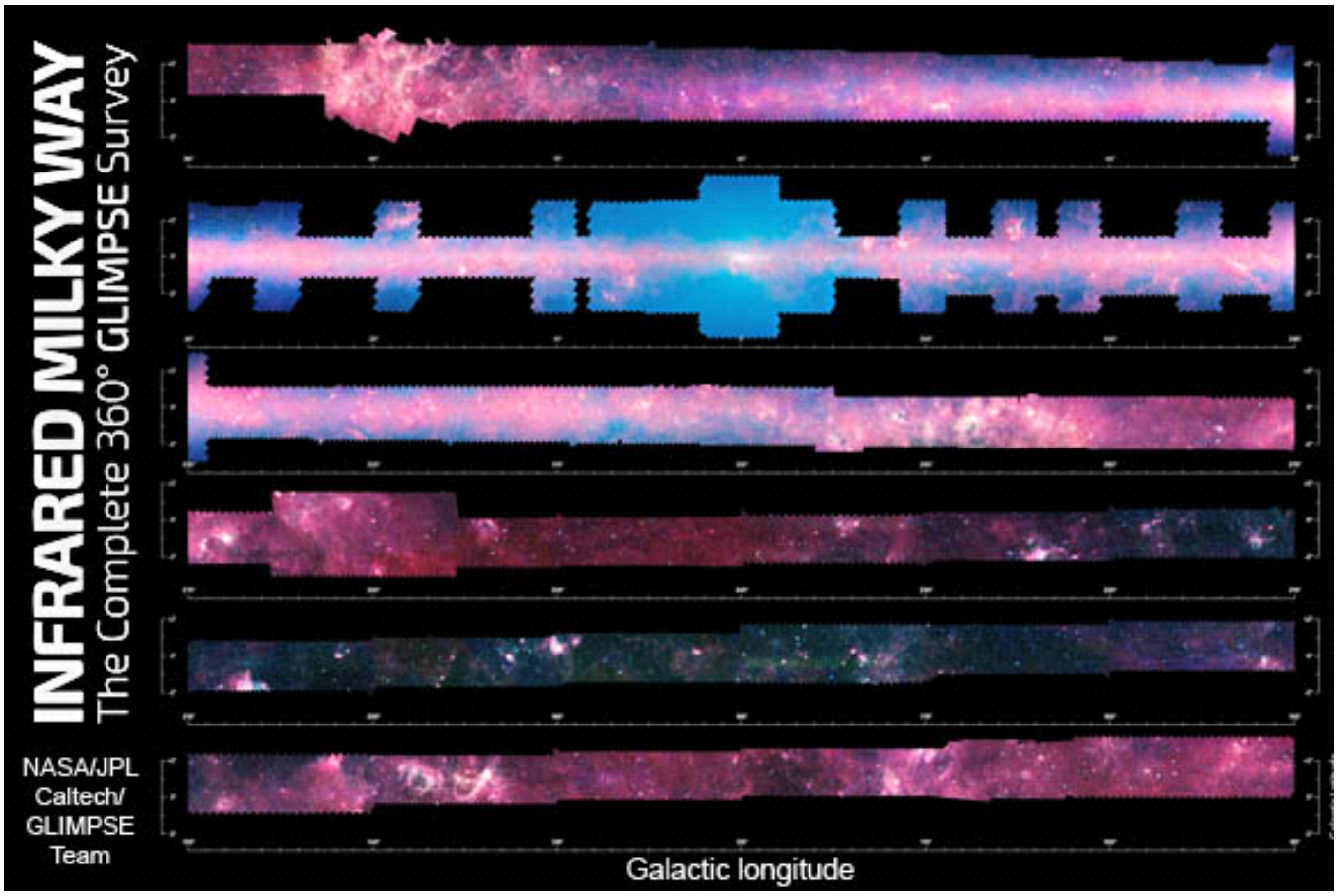
Expanding Universe – Astronomers from the Sloan Digital Sky Survey have used 140,000 distant quasars to measure the expansion rate of the Universe when it was only ¼ of its present age. The result was 218 km/sec/megaparsec. Measuring the expansion rate at different times in the history of the Universe is important for determining the characteristics of dark energy, the unexplained force that is speeding up the expansion. The new work measured the redshift of dark spectral lines imposed on quasar light by all the clouds of gas penetrated by that light on its way to us. Then a map of the gas clouds is produced, and the size of oscillations in the gas clouds (essentially caused by sound waves reverberating through the Universe) is determined, and from that the expansion rate of the Universe can be calculated. The astronomers claimed that errors in this method should be under 2%, which is extremely accurate compared with other methods of measuring the expansion rate.

LADEE (lunar dust mission) has gradually lowered its orbital altitude to continue making science observations as close as possible to the Moon's surface. As I write this, LADEE is scheduled to run out of maneuvering fuel and crash on April 21, on the far side of the Moon. It will gather its final data about 1-2 miles (2-3 km) above the surface. The Moon's gravity field is so lumpy and the terrain so highly variable that frequent maneuvers are required to prevent crashing. The instruments gather data on the Moon's dust and extremely thin atmosphere, both of which are thought to vary considerably quite near the surface.

Philae (comet mission) was successfully wakened up after hibernating most of the way to its target comet 67P/Churyumov-Gerasimenko. Philae is scheduled to land on the comet surface November 11, at which time it is expected to send back high-resolution pictures of the surface and perform analysis of the composition of surface ices and organic material. A drilling system will take samples from a depth of 9 inches (23 cm) and analyze them. Philae is riding piggyback on the European Space Agency's Rosetta comet orbiter spacecraft. Rosetta will orbit the comet for a year to watch its activity from warming as it approaches the Sun (near point in August 2015).

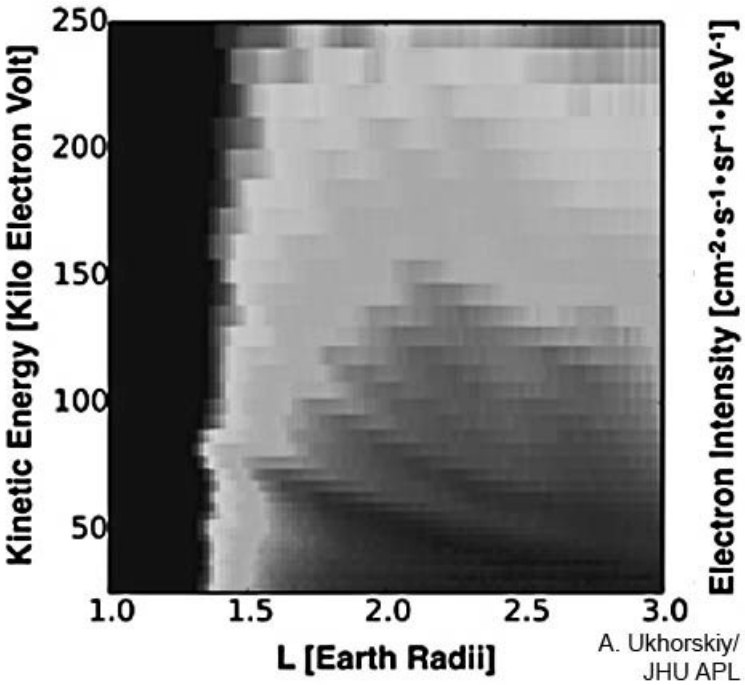
International Space Station (ISS) has experienced a computer failure in the system that controls robotics. The planned launch of a Dragon cargo ship to ISS is proceeding, since the robotic arm that docks such cargo ships has redundant computers. After that docking, astronauts will perform a spacewalk to replace the failed computer, which is mounted outside the station.

Instant AstroSpace Updates



Scientists have released a **20-gigapixel mosaic** of more than 2 million infrared snapshots taken over the past 10 years by the Spitzer Space Telescope, covering most of the Milky Way.

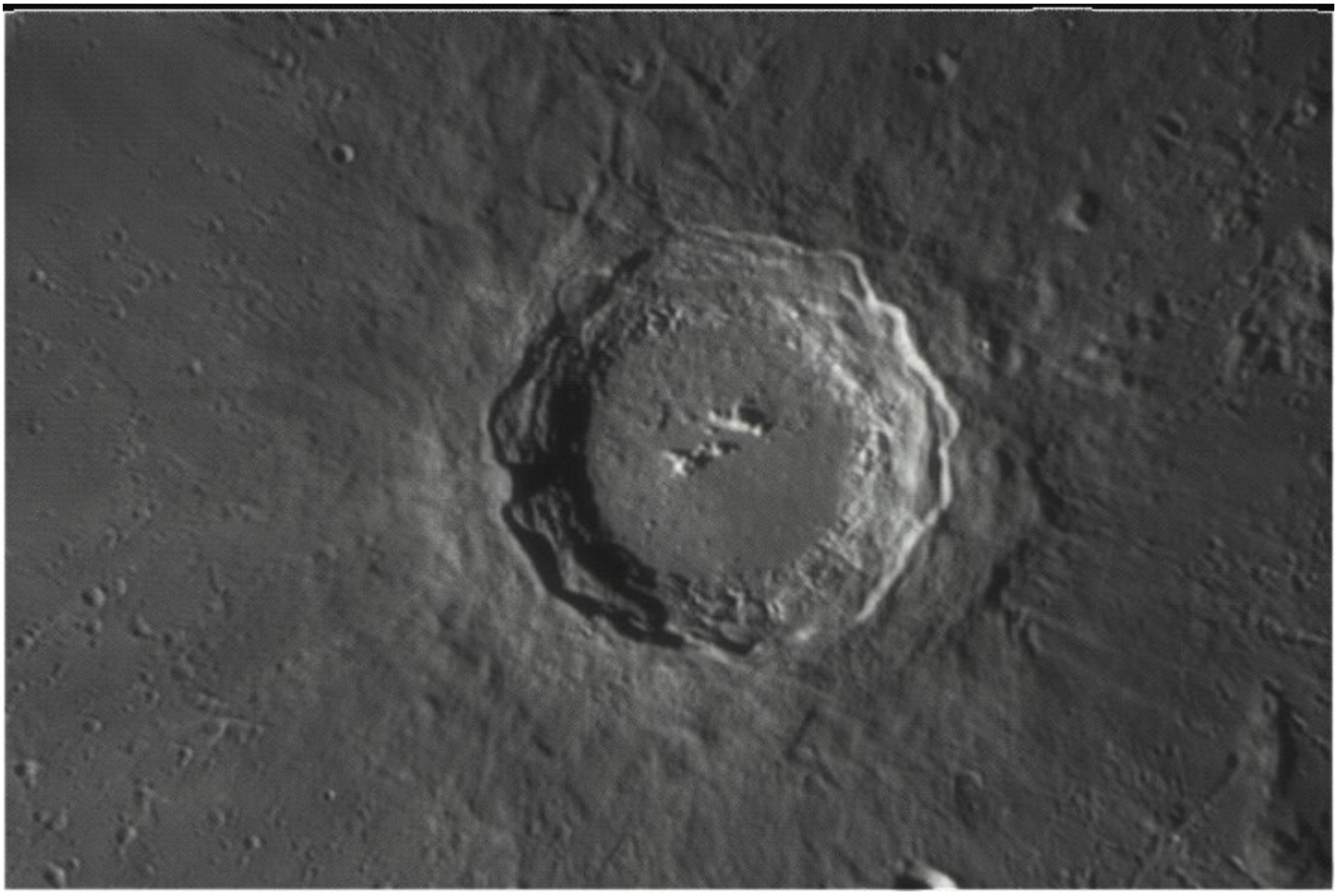
The Chinese lunar rover **Yutu** remains partially functioning, but is unable to roll or to move its solar panels. It has exceeded its planned mission life of 3 months.



Scientists using data from the twin Van Allen Probes spacecraft have found that the inner part of the Earth's radiation belt is organized into patterns that resemble **zebra stripes**. They were found to be caused by the Earth's magnetic field rotating through the belts.

Mars rover **Opportunity** experienced a couple of cleanings of its solar panels by Martian wind, and is now generating lots of power for further explorations.

A survey made in ultraviolet of 89 white dwarf stars found that 1/3 of them have more silicon and carbon in them than would be expected, which implies that leftover material from planet formation was pulled into those stars. This means that about 1/3 of Sun-like stars form **rocky planets**, before they burn out and become white dwarfs.



Bill Hall created this image of the lunar crater Copernicus using a 10-inch f/15 Newtonian and a Celestron NexImage 5 imager with Televue 3X Barlow. A relatively recent crater, Copernicus was formed sometime in the past 1.1 billion years, a period known as the Copernican period in lunar geology. The ray system of Copernicus extends up to 800 kilometers from the crater itself. Copernicus is 93 kilometers in diameter; the area covered by the crater could contain Orange County three times over.

Mt. SAC 2014 Kepler Lecture & Awards Ceremony

Thursday, April 10, 2014

Steve and Bonnie Short with Dr. Yeomans

The Mt. San Antonio College Foundation hosted an event at their Design Technology Center with JPL Senior Research Scientist Dr. Donald Yeomans as the keynote speaker. His talk was titled "Near Earth Objects: Finding them before they find us", also the name of his new book.

Dr. Yeomans is the Manager of NASA's Near-Earth Object program. He was the Radio Science team chief for NASA's Near-Earth Asteroid Rendezvous (NEAR) Mission and also the NASA Project Scientist for the Japanese mission to land upon and return a sample from a near-Earth asteroid (Hayabusa). Dr. Yeomans was also a scientific investigator on NASA's Deep Impact mission that successfully impacted comet Tempel 1 in July 2005.

He provided the accurate prediction that led to the recovery of comet Halley at Palomar Observatory on October 16, 1982 and allowed the discovery of 164 BC Babylonian observations of comet Halley on clay tablets in the British Museum.

Mt. SAC Observatory

Before the lecture, we mingled with the Mt. SAC staff and other guests looking at posters the students had set up explaining their astronomy projects. There was also a long table of great food brought in by caterers that everyone enjoyed, especially the meat balls and stuffed mushrooms.

The lecture itself was great and very informative if one was not aware of the asteroid dangers that lurk in Earth's orbit. He offered a solution to avoid an asteroid impact on Earth by sending up a rocket and letting the asteroid slam into it thus changing the velocity and orbit so it would miss Earth.

After the lecture and awards, we were bussed down to the building that now has a big dome and 16" Meade telescope set up this past year. This VIP party was catered with delicious desserts and coffee while a student pointed the telescope at Jupiter for guests to see. I spoke to Dr. Yeomans at the VIP party about the danger of a comet that might collide with Earth which we might not even see coming until it was 500 million miles away.

The Meade 16-inch telescope

These Mt. SAC lectures are held every year in Walnut and I would highly recommend that members of the OCA take the time to attend. They are very well organized and the staff and students are highly motivated and very friendly. They always have an interesting speaker too. Other OCA members attending this event were Bill Hall & his wife and Shelia Cassidy.

2014 G. Bruce Blair Medal Awarded to Richard Ozer

For his long and diverse record of contribution to the amateur astronomy community, this year's G. Bruce Blair recipient is **Richard Ozer** of Oakland, CA. Born 1961 in the San Fernando Valley, Rich lived half his life in the Los Angeles basin. He owes his love of astronomy to his 7th grade science teacher, who was an LAAS member who built an observatory on -campus for weekly public observing. That's also when Rich built his first telescope (which he still has) out of a sewer pipe and Edmunds optics, placed on a pipemount equatorial.

While studying Natural Resources and Environmental Policy at UC Davis, with graduate work at UCLA in Architecture and Urban Planning, Rich started his own database consulting company. He then moved to Northern California to start his current company, Office Information Systems, in the mid 90's. He's been married 24 years and has a daughter who also lives in Oakland.

Rich says his biggest contributions to the hobby have been organizational; keeping things going so that the amateur astronomer community can continue to pursue its interests with the necessary resources in as many dark sky sites as possible.

At The Chabot Space & Science Center, Rich has codirected the Telescope Makers' Workshop with Dave Barosso for nearly a decade (since Paul Zurakowski retired).

When he was President of the Mt. Diablo Astronomical Society in the early 2000's, it was during a time when they needed to increase membership, create a more active observing program on the mountain, and improve their relationship with the state parks, all of which were achieved.

For the last three years, Rich has been the Treasurer of the Mt. Diablo Observatory Association and, along with a handful of others such as Jon Wilson, Jack Borde and Bob Minor, responsible for the technical maintenance of the observatory and promotion of its programs.

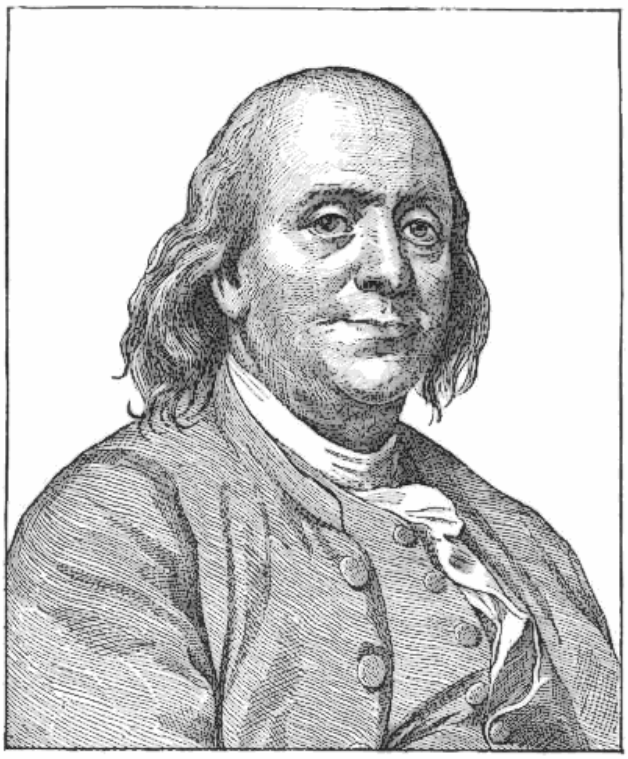
For over a decade, Rich has been Treasurer of the Astronomical Association of Northern California, providing grants to astronomy oriented programs throughout Northern California.

Also, along with Ken Frank and Mark Wagner, Rich managed the transition to a more modern mission for our association. For eight years, Rich has been Director of the Golden State Star Party held annually in Lassen County, the largest West Coast event of its kind after RTMC (and he also runs the judging of RTMC's Telescope Merit Awards). Prior to that, for three years he was director of the Shingletown Star Party in Shasta County.

For four years, Rich has been Treasurer for the East Bay Astronomical Society and involved in many of its special projects including prepping Carter Roberts' home after his passing (which sold for over a million dollars, the proceeds going to the Chabot Space & Science Center), the EAS/CSSC library, restoration of Chabot's Compass Rose, and resurrecting a working machine shop at the CSSC. Most recently, Rich has been involved in resurrecting the Group70 large aperture telescope project; primarily with regard to reviving its organizational structure and assisting Dave Barosso, its President, in managing its assets.

Daylight Saving Time

By Jon Wilson



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.

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SIRIUS ASTRONOMER
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