SIRIUS ASTRONOMER

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Rob Roberson created this image of M33 on October 10, 2010 using nearly two hours' worth of exposures through an 8-inch SCT. The Triangulum Galaxy is an early morning object this month, appearing just before sunrise, but there are many, many other galaxies visible all night during the spring and summer months!

OCA CLUB MEETING

The free and open club meeting will be held May 13th at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. This month, our featured speaker is Mike Simonsen of the American Association of Variable Star Observers.

NEXT MEETINGS: June 10, July 8

STAR PARTIES

The Black Star Canyon site will be open on May 28th. The Anza site will be open on May 28th. 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 on Friday, May 6th at the Centennial Heritage Museum at 3101 West Harvard Street in Santa Ana. Next month the class will be offered on June 3rd.
GOTO SIG: TBA
Astro-Imagers SIG: May 17th, Jun. 21st, Jul. 19th
Remote Telescopes: TBA
Astrophysics SIG: May 20th, Jun. 17th, Jul. 15th
Dark Sky Group: TBA

Around OCA - May 2011

By Barbara Toy

OCA Observatory Custodian and Member Liaison

Well, if anyone was thinking of doing the Messier Marathon at the April Star party, the weather unfortunately put an end to those dreams. The forecast was so dismal that Alan and I didn't even go out to Anza on the day of the star party, but one person who was out there told us that he got about fifty minutes of clear sky and then the fog rolled in and was still there next morning. We keep hoping for better weather around the new moon, but so far Mother Nature has continued this perverse correlation of bad weather and dark sky weekends. Maybe things will be better in May….

Anza Clean-Up

Any of you who have been out at Anza at this time of year know that it is notable for weed growth, particularly after a wet winter. When the weather warms up, it's amazing how fast the weeds spring up, and how high they can get in just a week or so. Besides all of the native vegetation, we get stands of mustard that quickly develop woody stems if they aren't cut down quickly. All of the weeds common to Anza can increase our fire danger if they're not cut back, which is a major part of why we require that the weeds on the site be cleared by the end of May.

If you are a pad or observatory holder, one of the requirements of your license is that you clear the weeds around your pad or observatory, including the parking area, by the end of May. Actually, the pad and observatory holders on each level are responsible between them for clearing the weeds on that level, not just around their individual pad or observatory. This still leaves the common areas, such as the Foodball Field, the area around Anza House, the area around the club observatory, and the roads and paths from one area of the site to another, all of which also need to be cleared.

If you use the Anza site at all, please plan to bring clippers and other equipment to help clear these common areas. The club has a couple of weed wackers in the storage shed behind the observatory, which anyone on the site can use to help clear the weeds, so please plan to spend some time using them for the common good if you don't have your own equipment. If you want to bring your own weed whacker to help out – that would be very welcome, as well.

Dave Radosevich has generously said that we can use his trailer during the Anza site cleanup to help haul refuse from the site to the transfer station in Anza (trash is hauled from the transfer station to a landfill somewhere else in Riverside County). The May star party is Memorial Day weekend this year, and we will try to have the trailer available then for those who make it out to Anza instead of going to RTMC (see below) or doing other Memorial Day activities. We also have a star party the following weekend, on June 4, and hope to have it available then, too. Even though we're working to make the trailer available, it remains the responsibility of the members to remove the trash and debris they are responsible for from the site themselves, as we can't get regular trash service for the Anza site.

New Anza House Coordinator

You may recall that we have been in need of a new Anza House Coordinator. I am very happy to announce that we now have an excellent volunteer for this important position: Doug Acrea. Those of you who have spent time in Anza House around star parties over the last few years have most likely met Doug, as he often spends several days out at Anza in the week before star parties. He also participates in the outreach program and, as an active Star Member, has hosted classes using the club observatory at Anza for astronomy field trips. More recently, he developed a strong interest in astroimaging, and is now a member of the AstroImage SIG. When he is out at Anza, he can often be found gathering photons on Mars Hill when he is not at Anza House or the club observatory.

We are really delighted that he is willing to take on the responsibilities of the Anza House Coordinator, and we on the Board look forward to working with him in that capacity. All Anza House coordinators can use help, however, so please offer him your services when you are out there to help keep Anza House clean, in good repair and running smoothly.

Changes in Anza House

While on the subject of Anza House, on your next trip to Anza, you might notice that there have been some recent improvements there. Specifically, the unused fixtures, counters, etc., in the back kitchen have been removed, and the area has been modified to be a workroom, with counters serving as desk areas running along both sides of the room. This should give folks using Anza

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TOP TWENTY THINGS AN ASTRONOMER SHOULD SEE

5 The Midnight Sun

By Helen Mahoney

With all that we know about the solar system and the universe, it is still easy even today to think of the world as flat. All that our senses experience tells us that the earth is flat. The sun, moon, and stars "rise" and "set". It still seems strange to see a live satellite news story from Japan or the Middle East on the late night news and see the reporter in daylight.

The sun from Alaska (70º 14' 05'' north latitude) at midnight on July 24, 2004 (Isaac Dominguez Santos)

The concept that the Earth is a ball was controversial for quite a while. Most ancient cultures described the earth as flat with a dome of the sky above. There were rich stories in the mythology of the Norse, Egyptian, pre-classical Greek, Middle Eastern, Chinese, and other cultures about what lay above, below, and at the edges of the earth.

Although Pythagoras in the 6th century BC proposed the idea of a spherical earth, it was not a well accepted idea until it was adopted by Aristotle in around 330 BC. Aristarchus of Samos, in the third century BC, was the first person to propose a heliocentric universe, and assumed that the earth was spherical ("round") in his astronomical writings. Eratosthenes of Cyrene (now part of Libya) around 240 BC not only proved it, but calculated the circumference of the earth and invented the latitude and longitude grid pattern still used today.

So while we intellectually know that the earth is a sphere, our gut tells us it is flat. Things change, however, as you start to go closer to the poles. In northern latitudes in the United States, the summer days are long and the opposite happens in the winter. And above the Arctic Circle, things are so strange they mess with your mind.

The Arctic and Antarctic circles (66.56 degrees North or South latitude, respectively) are the lowest latitudes on Earth where, for at least one 24 hour period each year, the sun never sets (the summer solstice) or never rises (the winter solstice). Higher latitudes (farther north or south) have more days during which this happens, right up to the poles themselves, where the sun appears on the spring equinox, and doesn't set for six months.

The reason for this, of course, is the approximately 23.44 degree tilt of the earth—the same thing that causes the Northern and Southern Hemispheres to have opposite seasons. It is easier to see it in an animation than to try to visualize it (I found several animations on You-Tube). I wondered how it would look from the ground—how the sun could go around and not set.

My opportunity to see the Midnight Sun was on our trip to Alaska in 2004 to see the transit of Venus (article # 3, coming up). From Coldfoot, about 60 miles above the Arctic Circle, this is what I experienced:

The sun didn't get very high in the sky. At noon, it was about 23 degrees up, and at midnight it was lower. In summer here in Southern California, the sun rises farther and farther north each day after the vernal equinox until it reaches its farthest point north on the summer solstice. Then it moves back, rising more to the south each day until the winter solstice. Above the Arctic Circle, that northern point has moved all the way to directional North. So, the sun starts at its lowest point above the horizon at geographic North at midnight, goes across the eastern sky in the morning, to its highest and southern most point at noon, and then across the western sky to the north in the afternoon and evening, back to the north at midnight. In other words, it makes a circle around the sky, not very high off of the horizon at any point.

Since it never got dark, but just looked like late afternoon from about 8 pm to 4 am, it was hard to know what time it was. At about 2 am, all the birds stopped chirping and went to sleep. Some mysterious signal told them it was nighttime. At about 3:30 am, they all woke up again, and went about their morning routine.

I didn't sleep until I went down to take a nap at about 8 am. I had officially been up—and in daylight—for 24 hours. It was a pretty special 24 hours of my life.

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AstroSpace Update

May 2011
Gathered by Don Lynn from NASA and other sources

Integral (European orbiting gamma-ray telescope) has observed extremely hot material just a millisecond before it plunges into the black hole Cygnus X-1. The observations also found evidence for strong structured magnetic fields at this location, the closest to a black hole that magnetic fields have been detected. It appears that the magnetic fields divert a fraction of the infalling material into jets that shoot some of the material outward, barely escaping falling in. The Integral observations found polarization of the gamma rays that is characteristic of charged particles spiraling about a strong magnetic field. More than 1300 hours of observations of Cygnus X-1, taken over 7 years, had to be averaged in order to find the weak polarization signal. This shows that the jets originate extremely close to the edge of the black hole, more so than any other type of observation has been able to show.

Suzaku (Japanese orbiting X-ray telescope) – The density of baryonic (ordinary) matter (protons & neutrons) and the density of non-baryonic dark matter in the Universe have been fairly precisely measured in recent years, by means that include the WMAP spacecraft's measuring of the Cosmic Microwave Background. It was at first expected that the ratio between ordinary and dark matter should be roughly equal at all places, at least if a large volume of space is measured. But the first precise measurements of galaxy clusters consistently showed too low of a ratio, that is, not enough ordinary matter. Recent measurements of the outer parts of galaxy clusters showed promise of solving this mystery, but in fact went beyond solving the problem. That is, there was so much ordinary matter in the outer parts of galaxy clusters that now the ratio was too high. A new study of the Perseus galaxy cluster by Suzaku appears to have finally solved the mystery. These observations confirm that the ratio of ordinary matter is higher in the outer parts of the cluster, but only in clumps. Presumably between the clumps, the ratio is lower. The result is that the average ratio of ordinary matter to dark matter for the whole Perseus galaxy cluster now appears to match the ratio for the Universe. Most of the ordinary matter in a galaxy cluster is contained in the hot gas between the galaxies, and this hot gas is most easily observed in X-ray wavelengths of light. The Perseus galaxy cluster is 250 million light-years away, and is the brightest source of X-rays over any extended area outside our Milky Way.

Gamma-ray bursts (GRBs) – A new simulation of neutron stars merging shows that the resulting black hole forms a very powerful magnetic field in the shape that would produce jets of matter and gamma rays. This confirms the leading theory of the cause of short GRBs (those lasting less than 2 seconds), that they are produced by such a merger. Long GRBs have long been believed to be caused by certain types of supernova explosions. The new simulation showed that in a matter of milliseconds, 2 closely orbiting neutron stars will rapidly lose energy through the emission of gravitational waves, then merge into a black hole. The resulting magnetic field is amplified by 1000 times from that of the neutron stars, and becomes organized into the shape of jets. The simulation ran on a supercomputer for 7 weeks in order to simulate just 35 milliseconds. The jets themselves did not form by the time the simulation ended, but previous simulations showed jets forming in magnetic fields like the one that formed in this new simulation. GRBs are among the brightest events known, emitting as much energy in a few seconds as an entire galaxy does in a year. Most of this emission comes in the form of gamma rays, the highest-energy form of light. Because the short GRBs fade quickly, it has proved much more difficult to understand them than the long GRBs. The ultimate proof of the short GRB theory will come when gravitational wave detectors get sensitive enough to see the gravitational waves that neutron star mergers produce.

Persistent gamma-ray burst (GRB) was discovered by the Swift orbiting telescope on March 28, but unlike any other known GRB, this one kept giving off bursts of X-rays for several days. Further observations made with the Hubble Space Telescope and the Chandra orbiting X-ray telescope showed that it occurred precisely at the center of a distant galaxy located about 3.8 billion light-years away. This appears to be a new type of GRB, which is caused by the supermassive black hole at the center of a galaxy swallowing a star. Some of the material of the star, instead of falling into the black hole, is ejected along the black hole's 2 jets, along with large amounts of X-rays and gamma rays. One of these jets happens to be aimed at us. Astronomers have previously detected stars being torn apart by black holes, but have not seen such bright X-rays and gamma rays, apparently because the black hole jets are usually not aimed our direction.

Merging black holes – New research on black holes colliding shows that they emit gravitational waves more strongly in one direction, which kicks the resulting merged black hole like a rocket. This should often cause the black hole to encounter and consume stars that were previously at a safe distance away. Thus newly merged black holes should statistically be far more likely to be showing bright X-ray activity from consuming matter. Looking for this X-ray signature may be the best way to search for merging black holes, at least until gravitational wave detectors become sensitive enough to see the merging event.

Merging white dwarfs – When a smaller star runs out of hydrogen fuel, it shrinks to an Earth-sized ball and slowly cools off. We call this dead star a white dwarf. Astronomers have just discovered the closest (about 140,000 miles or 225,000 km) pair of orbiting white dwarfs known, which orbit about each other in only 39 minutes. It is calculated that they will lose energy through gravitational waves and collide and merge soon (astronomically soon, which means about 37 million years in this case). Only a handful of other closely orbiting white dwarf pairs are known. If the mass of a merged pair of white dwarfs exceeds about 1.4 times our Sun's mass, then the resulting star will collapse in a supernova. However, the mass of this newly discovered pair will be below this limit, so the resulting star will start nuclear burning of helium, and have a new life as a normal star. The discovery was made as part of a survey program at the MMT Observatory in Arizona, which also discovered another dozen white dwarf pairs, half of which are close enough to cause future mergers, and all of those have enough mass to become supernovas.

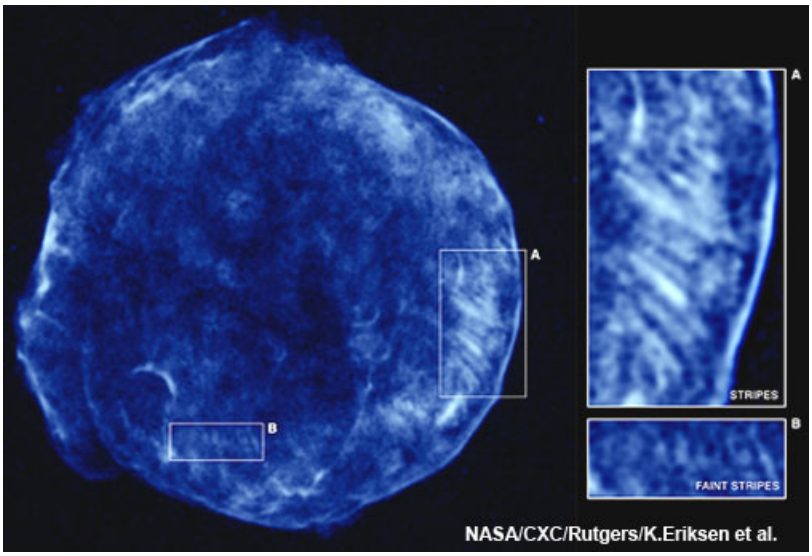
Kepler has been staring at about 170,000 stars to find planets that happen to pass in front of some of them, but has also produced data valuable to asteroseismologists, those who study the oscillations in stars. Such oscillations provide information about star mass, radius, age and internal structure. Kepler has detected such oscillations in 500 Sun-like stars, vastly adding to the candidates for further asteroseismology study. In addition, analysis of such oscillations in red giants found by Kepler has produced a new way to distinguish various types of red giants, which in the past have been hard to separate. Those still fusing (nuclear burning) hydrogen were found to have periods of oscillation of about 50 seconds, while those fusing helium were found in the range of 100 to 300 seconds.

Coolest star – Observations made with the Very Large Telescope in Chile and the Keck telescope in Hawaii have found the coldest known star, a brown dwarf whose surface is about the temperature of boiling water on Earth. At this low temperature, astronomers expect the brown dwarf to have different properties than warmer ones, more resembling gas giant planets. It is possible that water clouds could exist in the atmosphere of such a cool star. Brown dwarfs are essentially failed stars, lacking enough mass to sustain the nuclear fusion that powers ordinary stars. The cool star is 1 of a binary brown dwarf. The pair is 75 light-years away. It will be observed further to determine its orbit about its companion and allow calculating its mass. Preliminary estimates are that the components are separated by about 3 times the Sun-Earth distance, and take about 30 years per orbit. The record for coolest star may not last long, as 2 other very cool brown dwarfs have been found in Spitzer infrared space telescope data, and they are being measured with further observations.

Young star jets – Astronomers using the Spitzer infrared space telescope have discovered that 2 symmetrical jets shooting away from opposite sides of a young star are experiencing a time delay: Knots of gas and dust from one jet blast off 4.5 years after identical knots in the other jet. The young star is known as Herbig-Haro 34, and has long been known to have one jet. Infrared observations showed the 2nd jet had been hidden by dust from visible light observations. The discoverers say that some kind of communication is going on between the jets, probably carried by sound waves. More studies will be made to determine if other young stars with jets show this time-delay behavior.

Hubble Space Telescope (HST) observations have found a galaxy so distant that its light left there only 950 million years after the Big Bang. This is not the record for the farthest galaxy, but it might be the record for the earliest galaxy formation, since some of its stars were already 750 million years old. It was so dim that it would not have been detectable if not for a galaxy cluster (Abell 383) that happens to lie in front of it. The gravity of the cluster acts as a lens and amplifies the light by a factor of 11.

Dark Energy – Astronomers using the Hubble Space Telescope have ruled out one alternate theory that tried to explain the observed speeding up of the expansion of the Universe without relying on Dark Energy. That alternate theory was that an enormous bubble of relatively empty space surrounds our galactic neighborhood, and that bubble distorts our view such that expansion appears to be speeding up when it really is not. The new evidence is a further refinement of the study of Type Ia supernovas, the original of which produced the first evidence for the speed up. It is believed that the current expansion rate of the Universe is known from the new observations with an uncertainty of about 3.3%. The study refined the expansion rate at various distances, and therefore at various times in the past, using the supernovas as distance indicators. The new numbers further restrict the range of uncertainty in the strength of dark energy, the shape of the Universe, and the neutrino content.



Chandra (orbiting X-ray observatory) has made a long exposure of Tycho's supernova remnant and has found a pattern of X-ray stripes never seen before in such a remnant. The size of the stripes matches the size predicted by theory of the size of turbulent holes that could produce cosmic rays. The fact that they were stripes rather than holes was surprising. Cosmic rays are particles, most of them protons, that hit the Earth with energies far higher than anything produced in the most powerful particle accelerators on Earth. Turbulent magnetic fields in supernova remnants have been one of the leading theories as to how cosmic rays can reach such high energies. The observed supernova remnant is a glowing cloud of material left behind by the supernova explosion observed by Tycho in 1572.

Super-luminous supernova – Astronomers have found another extremely bright, rare supernova, but the reason for its excess brightness does not fit that of other super-luminous supernovas. Those others appear to be extremely massive stars in which pairs of particles become unstable, which lead to the explosion. The newly found one appears to have attained extreme brightness when the supernova shock wave struck a shell of material previously expelled from the star. Probably the star, before exploding, was a luminous blue variable, which are known to expel layers of material in episodes. Such collisions of the shock wave have been observed before, and these are known as "self-interacting" supernovas. This is the brightest observed self-interacting supernova. It is designated 2008am and was found to be 3.7 billion light-years away.

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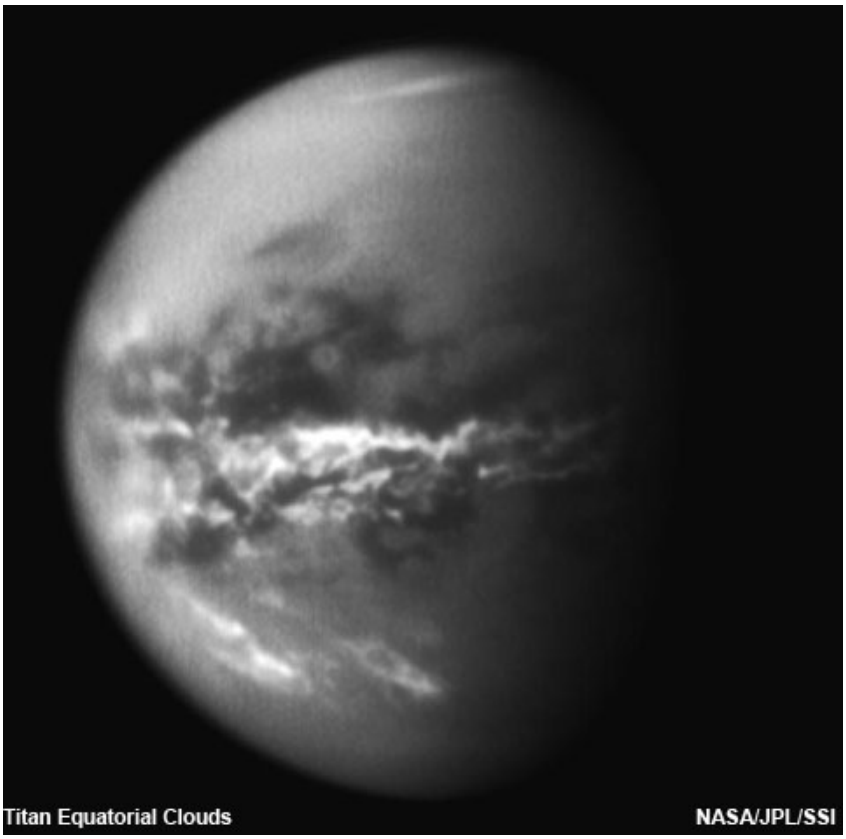
Herschel (European infrared space telescope) was used to image and measure networks of tangled large gas filaments seen within clouds of gas and dust between stars. Surprisingly, no matter what the length or density of these filaments are, the width is always roughly the same, about 0.3 light-years across. Observations were made of 90 filaments in 3 nearby clouds. It is not yet known why the widths are so consistent. It is believed that the filaments are formed by slow shockwaves from supernovas traveling through the clouds. Herschel images clearly showed that stars were forming like beads on strings in some of the filaments. One filament contained 100 infant stars.

Exoplanet atmosphere – It was reported here in January that an exoplanet designated GJ 1214b was the first super-Earth planet (larger than Earth, but smaller than a gas giant) to have its atmosphere measured, and one possibility was that it contained steam. Further study has ruled out the other possibility, and has measured the water content of the atmosphere at about 10%. The temperature is predicted to be about 535° F (280° C), so it is not all that Earth-like. This temperature is a result of orbiting close to its star. 2 theories have been proposed for how such a planet could have formed: direct accretion near where it now orbits, or formation further out where ice can form, with later migration to the warm zone near its star. The 1st theory should produce considerable hydrogen and helium in the atmosphere, but since these were not found, the 2nd theory is supported.

Cassini (Saturn mission) has found that the rotation rate of Saturn's magnetic field varies with seasons, and is different in the northern and southern hemispheres. Jupiter's magnetic field has shown no variation in its rotation rate, and so it was originally assumed that the magnetic fields of all gas giants would be locked into synchronization with the planet's core rotation. So it was a surprise many years ago to discover that Voyager, Ulysses, and now Cassini measured different rotation speeds for Saturn's magnetic field. The rotation of the magnetic field is measured by the radio waves that it emits. New analysis of Cassini data shows that the winter hemisphere magnetic field rotates about 1% faster, and the summer hemisphere about 1% slower than average. About 7 months after the recent Saturnian equinox, when seasons change, the northern magnetic field had slowed to the same speed as the now faster southern magnetic field. It has also been found that the northern and southern auroras on Saturn wobble in synchronization with the seasonally changing magnetic field rotation speeds. The core of a giant planet could not possibly change rotation speeds by the amount that the magnetic field rotation changes, so it is thought that some effect at the surface is distorting the magnetic field seasonally.


Titan Equatorial Clouds NASA/JPL/SSI

Titan – As spring unfolds at Saturn, the equivalent of April showers have been spotted in the equatorial regions of the largest moon Titan. But it's methane rain, not water. Until recently Cassini had observed that the equatorial regions seem to be vast deserts of sand dunes, without clouds or rain. But large equatorial cloud systems formed late in 2010, and after storms passed, some areas have darkened. The best explanation is that the dark areas are ones that remained damp with methane. A full Saturn (and Titan) year is over 29 Earth years. There are dry channels in the equatorial regions, apparently formed by flowing methane. But the question remained as to whether the channels formed from seasonal rains (since none had been yet seen) or whether the channels formed long ago when the climate might have been different. These observations support the former explanation.

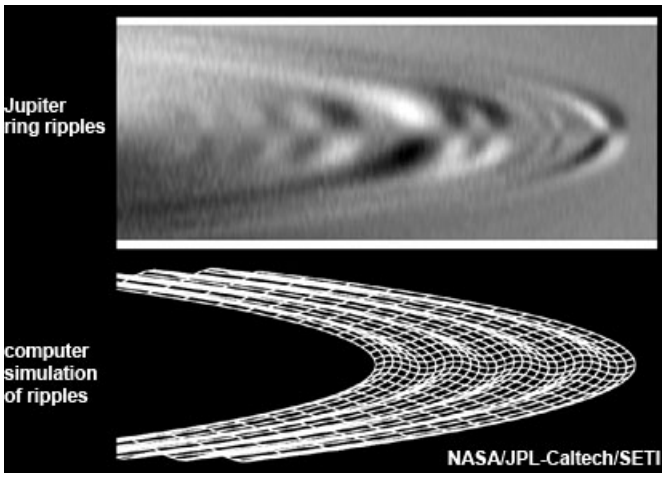
More Titan – A new analysis of images of Titan claims that the surface features can be explained by weathering and impacts without attributing any to ice volcanoes. This is in contradiction to a recent study by another group of scientists that claimed evidence of ice volcanoes. Expect the debate to continue.

Hayabusa (Japanese asteroid sample mission) – A preliminary analysis of samples returned from asteroid Itokawa show that they have similar composition to stony meteorites that commonly fall to Earth. No organic (carbon) molecules have been found. The samples formed about 4.6 billion years ago, when the solar system formed. This was all found by analyzing dust grains smaller than a human hair, because this is all that was recovered. As reported earlier, the spacecraft sample mechanism misfired, but at least 1500 tiny dust grains drifted into the sample chamber anyway and were found when the chamber was opened. The particle accelerator being used in analyzing Hayabusa samples was damaged by the March earthquake in Japan. It is not clear when repair will be completed and analysis can resume.

Unusual asteroid designated 2010 SO16 was recently discovered in images from WISE (orbiting infrared telescope) and was found to have an unusual orbit. It is nearly circular, near the Earth's orbit, but never comes really close to Earth. As it approaches Earth, the planet's gravity causes it to shift into a somewhat larger orbit that takes it longer to orbit than the Earth. So it falls behind. Eventually it approaches Earth from the other side, at which time the planet's gravity shifts it into a somewhat smaller orbit that takes less time to orbit than Earth. So it slowly catches up to Earth again, only to repeat the actions. This behavior appears to be stable, so it has likely been in this orbit for several hundred thousand years. Relative to the moving Earth, it appears to follow a horseshoe shape of orbit. It takes 175 years to move through the horseshoe, end to end.

Another – Amateur astronomers measured the light variations in a newly discovered near-Earth asteroid known as 2011 GP59 and found that it was rotating every 7.5 minutes, quite fast for asteroids. It made its closest approach to Earth on April 15 at a distance just beyond the Moon's orbit. Analysis of its orbit showed that there is no chance of it hitting the Earth in the foreseeable future.

Meteoroid formation – Analysis of a pea-sized chunk of a meteorite gives evidence that the material in meteorites is well-traveled during their formation. The isotopes of oxygen were analyzed in various layers within the chunk, because the isotopes differed in various regions of the solar nebula during the time meteoroids (and planets) formed. 4 distinct layers were found. The innermost (and therefore earliest) one formed near the protosun, the next formed farther out where planets were forming, the next was either closer in than the previous region or else up out of the plane of the planets, and finally the chunk ended up in the asteroid belt.



Ring ripples – Scientists working with data from Cassini, Galileo (Jupiter mission), and New Horizons's flyby of Jupiter have determined that any comet passing by a ring system will leave a slowly tightening spiral ripple in the rings that lasts for many years. The ripples seen in Jupiter's ring were traced to the passage in 1994 of comet Shoemaker-Levy 9 on its way to crashing into the planet. The date of ripple formation can be calculated by how much the spiral has tightened. The ripples seen in the outer D and inner C ring of Saturn have been dated to late 1983. What hit the rings then was big, tilting a region of ring more than 12,000 miles (19,000 km) wide. No comet was seen passing Saturn at that time, but there was no spacecraft at Saturn then and the planet spent much of that time behind the Sun from our Earthly view, so the comet was probably just missed. 3 other ripples were seen in Jupiter's ring, one indicating a comet passed in 1990, and the others later. These comets also were not seen. The sizes of comets required to make these ripples was calculated, and all were a few miles wide. What these show is that comets hitting the rings of Jupiter and Saturn are common, occurring every several years.

Water in comets – Scientists have found for the first time convincing evidence of liquid water in a comet, shattering the current thought that comets never get warm enough to melt the ice that makes up most of their bulk. The discovery was made by analysis of dust brought back to Earth in 2006 from Comet Wild 2 by the Stardust spacecraft. That analysis found iron and copper sulfide minerals, which form in liquid water at temperatures between 122° & 392° F (50° & 200° C). Two possibilities for producing such temperatures inside a comet would be from minor impacts or from radioactive decay. Since one of these minerals is destroyed above 410° F (210° C), that part of the comet never exceeded that temperature. One of the minerals, Cubanite, exists in ore deposits on Earth and has been found in certain chondrite meteorites.

GOCE (gravity mapping satellite) team released a geoid calculated from spacecraft data, a 3 dimensional map of the shape of what sea level would be if tides, winds, currents, rotation and such forces did not exist, only the gravity of the lumpy Earth. GOCE is more sensitive than past gravity satellites, so the geoid is more precise and detailed. By comparing actual sea level to the geoid, data is obtained on ocean currents and circulation, sea-level change, and ice dynamics. Changes in the geoid reveal shifting tectonic plates and magma movements under volcanoes.

WISE (orbiting infrared telescope) team has released the 1st package of data from the telescope's survey of the entire sky in 4 infrared wavelengths. It includes 57% of the sky. The remaining data is scheduled for release a year from now. The legacy of this data is expected to endure for decades. Before WISE, astronomers had been using the IRAS (previous infrared survey) data for about 25 years.

Stardust-NExT, having completed both its original mission of returning a sample of comet Wild 2 and its second mission of a flyby observation of comet Tempel 1, was retired by spacecraft controllers. It was commanded to burn what little rocket fuel it had left, report on its current condition, then turn off its radio. The amount of fuel left on a spacecraft is estimated by subtracting the amount that should have been burned in all rocket firings from the amount that was loaded originally. Directly measuring the fuel left does not work in zero gravity. The amount burned by Stardust in its final blast (146 seconds) will now be used to calibrate the fuel estimation method for future spacecraft.

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House room to set up their computers and do whatever work they want to do without monopolizing the dining room table, which has been a problem in the past. There is also new flooring at the main entrance to Anza House and in the dining room instead of the previous carpet, which should help a lot in keeping those areas clean.

The person we have to thank for this is Gary Schones, who brought a worker out there to help him do this work. The goal is to make Anza House more usable, and these steps have really moved us toward that objective.

RTMC Astronomy Expo

In the past, Memorial Day Weekend has been notable in the local astronomy community for what is now called the RTMC Astronomy Expo, but originally was the Riverside Telescope Makers' Conference. This is Southern California's regional star party with related shopping opportunities, talks and other events. Last year RTMC was moved to the new moon weekend in May, which didn't happen to fall on Memorial Day weekend, but this year they coincide and RTMC is therefore happening at its traditional time. What the plan will be for next year remains to be seen – for people like me, who work during the regular work week, not having it on Memorial Day weekend creates a real problem for attending it, so I'm hoping they go back to the traditional approach.

Since it is the dark moon weekend, our May Anza star party is also on Memorial Day weekend, and this means that people who don't have non-astronomical obligations have to choose whether to go to the club star party or to RTMC. For those of you who haven't yet been to RTMC and who may be trying to decide which they want to do, here's a bit of an RTMC primer:

Before last year, RTMC started on the Friday of Memorial Day weekend, with most formal activities on Saturday and Sunday. Last year the event was extended by starting it earlier, on the previous Wednesday, so there would be five nights available for stargazing and related activities. That has carried over to this year, so those who have the extra time can start their RTMC experience on May 25, the Wednesday before Memorial Day.

All of this takes place at Camp Oakes, a YMCA camp not far from Big Bear City. You can camp there for the event, in tents or RVs. You'll find there are no formally marked camping spots so you can just set up in any spot that appeals to you that isn't otherwise occupied or designated as off-limits for camping. There are restrooms and showers in various locations around the site, and some dorm rooms available for reservations. Some people stay in Big Bear City and drive in for the festivities – you can see that there are several options. There are also people who just go for one day instead of making it a multi-day affair though, if you do that, I recommend that you stay until after the raffle if you are there on Saturday or Sunday – more about that later.

One feature of RTMC is the swap meet, where individuals bring things they want to sell. If you have some equipment you're not using and are thinking of selling, you should consider bringing it to the swap meet. This is on Saturday morning per the RTMC website, which you can find at http://www.rtmcastronomyexpo.org/general.html and which will give you more detailed information than I can here.

You'll also find a good array of commercial vendors, and one of the benefits of RTMC is the chance to see their equipment in action. It's fun to check out telescopes, eyepieces, binoculars, etc. from different vendors after dark, and a great way to do some comparisons – Saturday night is the best time for this. Vendors often bring clearance items of different sorts to sell to bargain hunters, and it's possible to get some great buys (or so I've heard. Unfortunately, I've never lucked into one of these great buys myself…).

Then there are the talks – on a variety of topics related to different aspects of astronomy (they provide a program so you can plan which ones to attend). Dr. Peter Jenniskens is the keynote speaker on Saturday night, talking about "The impact and recovery of 2008 TC3," the first meteor to be tracked before it hit earth and then recovered after the impact. That will be after the door prize raffle – always a big event, especially on Saturday night, when the biggest prizes are given away. Anyone who's present can get a ticket for the raffle, but you have to be present to win – and the grand prize often is a very nice telescope that any of us would be happy to call our own. In fact, you'll find that there are a lot of nice prizes given away during the raffle (all of which are donated by vendors, clubs and others participating in RTMC), even if they are overshadowed by the grand prize.

These are just some of the highlights of this event, and you'll see a lot of other activities described on the website. For most of us, though, the best aspect of RTMC is the chance to catch up with old friends and acquaintances, meet new people and put faces to people we know on line. What I remember most from past RTMCs is interesting conversations I've had with a lot of different people that gave me new insights and information to mull over long after the event was over.

OCA usually has a booth at RTMC, but it's unclear if we'll have one this year as we don't yet have volunteers to run it as of the time I'm writing this, and it's also unclear if Craig Bobchin or I will be able to go as we both have work commitments. We try to get an OCA group picture each year at RTMC, generally at our booth. This year – if we have a booth, please come there for the picture at 1:00 p.m. on Saturday. As a backup plan, if we aren't able to work things out and we don't have a booth, please meet in front of the meeting hall instead – this would be the side where people line up to enter the building for meals and events, not the side with the smokers. If you run into any other club members on your way to where the picture will be taken, please bring them along. And, if you have a camera with you, bring that, too, just in case… If you take any group pictures yourself, please send me a copy.

If you haven't had the RTMC experience yet, I hope you'll give it a try. If you have any questions about it, I'll be happy to try to answer them. And if you're interested in helping us with the OCA booth, I would definitely be interested in hearing from you at btoy@cox.net! ■

FOURTH ANNUAL COSMOS RESEARCH CENTER STAR PARTY AT ANZA
JULY 9, 2011

We will be holding our 4th annual star party at the Orange County Astronomers Club Observatory and the Mighty Kuhn 223 Telescope in Anza on July 9. The party is open to OCA members and their families and guests. We'll start with a BBQ, then have a science symposium to hear some presentations by young scientists, then have a wonderful evening star-gazing. The moon will be high in the sky, so we'll be studying the moon in depth, looking for craters and things on the surface of the moon at great detail. Bring your camera and become an astrophotographer! You can use anything from a cell phone camera to a high end digital single lens reflex. (We will have an adapter for Canon DSLRs, if you have one). We'll also see Saturn, and some nebula at the center of the Milky Way.

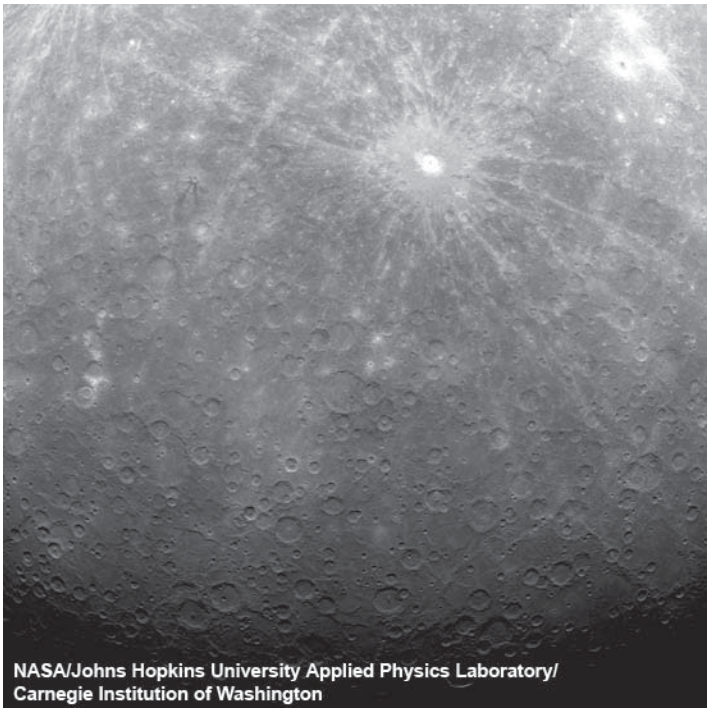
We are asking for a $5/per person donation to support the club observatory. Camping is available in the RV area near the Anza House, or arrangements may be available at the Anza House ($5 per person for the night)

Register online at http://anzastarparty.eventbrite.com

Spirit (Mars rover) has still not been heard from, as of this writing. The Sun angle on its solar panels became too low to generate sufficient power on March 22 of last year, so it put itself into hibernation mode. March of this year is when the Sun angle becomes highest, and so hopes were that recharging the rover's batteries, which would wake it up, should have occurred by now. So the rover controllers have changed their strategy. They are now sending signals to the rover that would command it to communicate with us, even if some damaging events have occurred in addition to hibernation. If this does not work within a couple of months, the rover will probably be declared lost. The rover had to have experienced lower temperatures during the hibernation than at any previous time since it arrived at Mars in January 2004, so damage to key parts is a definite possibility.

Opportunity (the other Mars rover) has completed a 3-month exploration of Santa Maria crater along the way toward its biggest target ever, Endeavour crater. Santa Maria has offered stunning vistas and a scientific bonanza. It is the largest crater that the rover will pass on its epic trek toward Endeavour, which is just 4 miles (6 km) away. Santa Maria was chosen for lengthy study because of the detection from orbit of hydrated (water containing) minerals. The crater is stadium sized and is about 30' (9 m) deep. The time spent studying Santa Maria included conjunction of the planet, when driving was to stop anyway, due to the loss of radio signal when the Sun came between Mars and Earth.

Messenger (Mercury mission) has returned the first pictures since going into orbit on March 17. About 1200 images were taken during a 3-day commissioning phase. Some images showed areas never before imaged by a spacecraft. The planet's north polar region was found to be unusually smooth, save for a number of ridges. Other areas were found to be covered with secondary craters, that is, ones made by material thrown out of a bigger crater made by asteroid impact. Some fresh impacts were also found, those with a bright crater and rays that indicate they are not old enough to have weathered darker. The Messenger camera takes images in 11 colors, ranging from violet through all visible light and into near infrared. Mapping of the entire surface in multiple colors has begun. Other instruments returning data are the altimeter and the magnetometer. Mercury, like Earth, has a magnetic field, while Venus and Mars have negligible ones, and it is hoped to answer why this is so. It has been 37 years since the first spacecraft images were made by Mariner 10, the only other visitor to Mercury.



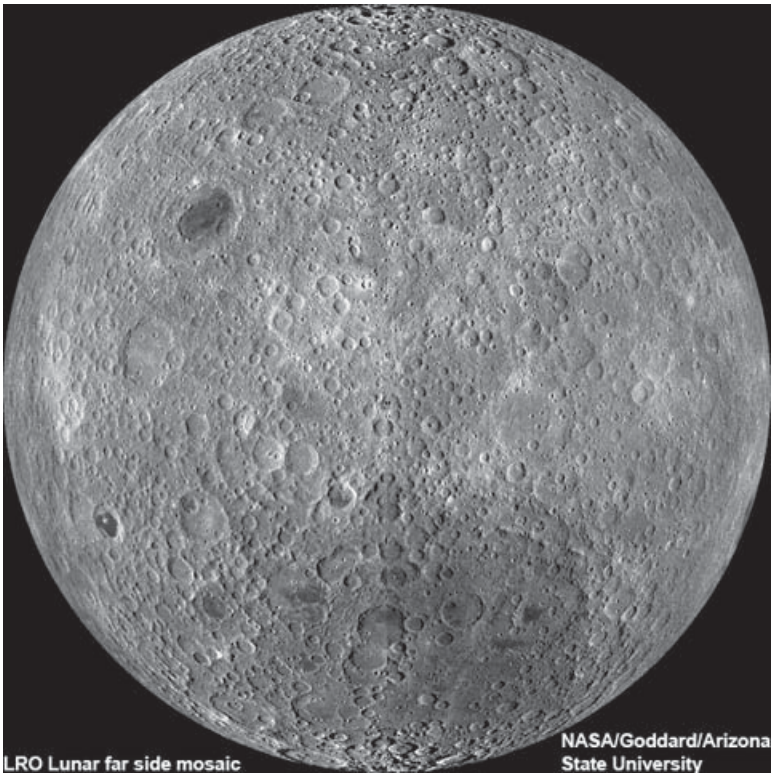
SPACEX (rocket company) announced that they are developing a heavy-lift rocket, which is essentially 3 of their Falcon 9 rockets strapped together. 1st test flight is scheduled for early 2013. It will deliver up to 117,000 lbs (53,000 kg) to low Earth orbit, more than any Delta or Atlas rockets, more than the Shuttle, but substantially less than the planned heavy lift rocket to be developed by NASA and private industry partners to replace the canceled Ares 5 rocket. Price per launch is planned to be about 1/3 that of existing heavy rockets.

Space Shuttles – NASA announced where the soon-to-be-retired Space Shuttles will be placed on display. The Smithsonian National Air and Space Museum in Washington DC/Virginia is giving back the Enterprise, the test Shuttle that flew only from airplane drops, and is receiving in exchange the Shuttle Discovery. Atlantis is going to the Kennedy Space Center Visitor's Complex in Florida, and Endeavour is going to the California Science Center in Los Angeles. The Intrepid Museum in New York gets the returned Enterprise. Honorable mention awards in the competition for Shuttles consisted of various shuttle simulators and trainers, and those are going to Adler in Chicago, Evergreen in Oregon, Texas A&M University, Museum of Flight in Seattle, and the US Air Force Museum in Ohio. Extra engines are going to the Smithsonian, the Space and Rocket Center in Huntsville, and Evergreen. Shockingly, Houston, home of the Johnson manned space flight center, got nothing but 2 seats out of a Shuttle. Some people in Houston are pretty ticked off.

Instant AstroSpace Updates

Researchers have discovered a new mineral made up of sulfur and titanium, having a unique crystal structure, during electron microscope study of a meteorite found in Antarctica in 1969. It has been named **Wassonite** in honor of a UCLA professor who has done much work with meteorites.

Physicists using the **Tevatron** particle accelerator in Illinois, scheduled to shut down this year due to obsolescence and lack of funding, have found a bump in data from proton-antiproton collisions that may indicate a new subatomic particle about 150 times the mass of a proton. More work is needed to verify that it is a particle, but if confirmed it will shake up particle physics greatly.



NASA has released a new set of data (the 5th) from **Lunar Reconnaissance Orbiter** (LRO) observations, including a global map of the Moon with about 100 yards (meters) per pixel, maps of visual, ultraviolet and infrared brightness, rock abundance, soil temperature, surface mineralogy, slope, surface roughness, elevations, albedo, neutron detection, and water-ice data.

GALEX (orbiting ultraviolet telescope) team has found a new technique to search for young, low-mass red dwarf stars, which are so dim they are often overlooked in visible light. Many such stars are quite noisy in ultraviolet.

SOFIA (airborne 100-inch [2.5 meter] infrared telescope) completed its 1st science flight using the GREAT high-resolution far-infrared spectrometer. First targets included IC 342, a spiral galaxy, and M17, the Swan or Omega Nebula.

Kepler (planet-hunting spacecraft) is back in action after suffering a safe-mode event that stopped science operations for 6 days in March. An anomaly response team has been formed to determine the cause of the event.

GOCE (gravity mapping satellite) has been using less Xenon fuel in its ion engine to maintain its low orbit, because of the record low solar activity, and so its mission should last at least an extra year, through 2013.

Lockheed Martin, manufacturer of the **Orion** space capsule, unveiled the first such spacecraft and opened their new facility (called the Space Operation Simulation Center) in Denver for use in testing Orions. The new spacecraft is expected to be ready for an unmanned test flight aboard a Delta IV Heavy rocket in 2013.

The March earthquake in Japan slightly damaged the space center that oversees the **Kibo Lab**, which is a part of the International Space Station. Control of Kibo was turned over to NASA in Houston, but has since returned to the space center in Japan.

April 12 was the 50th anniversary of the first **human flight in space** (Yuri Gagarin) and 30 years since the first Space Shuttle flight. A few days before, an astronaut and 2 cosmonauts took off from the same launch pad as Gagarin, bound for the International Space Station, in a rocket with Gagarin's picture painted on the side.

FOR SALE: Skywatcher 80mm f/11 refractor with equatorial mount and electronic drive; red dot finder; 2 Plossl eyepieces; diagonal; moon filter; accessory tray and 2x Barlow, $75. 4.5 inch f/4.7 Newtonian with table top equatorial mount and slow motion cables; 2 eyepieces; 6x30mm finder telescope and barlow lens, $50. Val Akins (949) 382-1869 (call anytime or leave message)

FOR SALE: TeleVue 5mm Radian Eyepiece, $125.00. Contact Bill Llano at 714-255-0845 or BELMARDUK@EATHLINK.NET

FOR SALE: 5x8X4 foot, 3500 limit load, enclosed trailer with 15inch wheels, removable top, carpeted floor with 4 tie downs, and 12 volt winch that raise/lower tail gate or pulls in anything on wheels. Trailer specifically designed to transport large dobsonian telescope. $1000. Equatorial telescope tripod for 10-15 lb optical tube assembly, build-in polar align finderscope, slow motion manual axis controls and counter weight. $80. Contact Dave at 949-492-5342

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