SIRIUS ASTRONOMER

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HOW TO USE YOUR TELESCOPE CLASS MOVED TO JUNE 27TH! SEE DETAILS, PAGE 3

This spectacular picture of the Rosette Nebula was taken by Arnie Rosner from Fountain Valley, CA on November 8, 2007. Further proof that not only astronomy but deep-sky photography from the heart of light-polluted Orange County is not a waste of time!

OCA CLUB MEETING

The free and open club meeting will be held Friday, June 13th at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. This month, Dr. Aaron Barth of UC Irvine will discuss black holes in nearby active galaxies.

NEXT MEETING: July 11th

STAR PARTIES

The Black Star Canyon site will be open on June 28th. The Anza site will be open on June 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, June 6th at the Centennial Heritage Museum at 3101 West Harvard Street in Santa Ana.
GOTO SIG: TBA (contact coordinator for details)
Astro-Imagers SIG: June 20th, July 15th
EOA SIG: Apr. 23rd, July 23rd
Astrophysics SIG: June 20th, July 18th
Dark Sky Group: TBA (contact coordinator for details)

President's Message

By Barbara Toy

We've already had "unseasonable" heat spells in April and May, along with some periods of June gloom to remind us of the weather we usually have at this time of year. Whatever else we might say about the weather prospects this summer, it looks like we're going to have a lot of heat. If / when you go out to Anza, remember that the sun can be particularly fierce out there during the day, and bring sunscreen along with a wide-brimmed hat, and plenty of fluids. And, even though the nights have warmed up a lot, it's good idea to bring at least a jacket because they still can be chilly, especially to people who aren't moving much around their astronomical equipment.

Along with the other effects of summer heat, we frequently get thunderstorms moving through our area, particularly in July and August. These often cause more damage to the local dirt roads than winter rainstorms as they tend to drop their water quickly and in a concentrated area – something else to look out for on your way in and out of our Anza site. Fortunately, even when the storms bring rain during the day, they generally (though, alas, not always!) clear up enough after dark for viewing.

With the warmer weather, all of the critters are now out now, and you should keep a weather eye out for them anytime you are at Anza, Black Star Canyon or any other rural or wilderness area. The most common creatures with poisonous bites in both of our viewing sites are rattlesnakes and black widow spiders. We also have scorpions at Anza, though these were apparently more common in the past than now, and bees, wasps, and red ants that sting. Both sites also have rats, mice, rabbits, ground squirrels, deer, coyotes, bats and other wildlife – please don't try to feed them or touch or pet them, as they can all bite, claw, scratch, kick or otherwise cause injury, and they also may carry disease. If you bring small children with you, please be sure they are closely supervised – there are plenty of ways a child could get hurt on our star party sites. And, although we've never had any problems with coyotes or other predators at either of our sites, they are around in both areas and could possibly see a wandering child as easy prey.

The other warnings to keep in mind at this time of year are not to put your hands, feet or other portions of your anatomy in or on any hole or crevice that you haven't checked first to be sure it isn't inhabited, stick to the paths and don't go off into the bushes when you move around the sites, especially after dark, don't be shy about advertising your presence so local wildlife can get out of your way, check ahead and to the sides of where you're walking for snakes and stay out of striking distance of any you see, and don't leave food around at Anza House or the observatory as that attracts rodents and we'd really prefer to keep them outside of our buildings as much as possible.

And, now that you're wondering whether you really want to subject yourself and your loved ones to all this – please also remember that, while you should keep these things in mind in any outdoor area (and black widows often show up even in well-populated areas), most people never see any of the wildlife that might cause problems at either of our viewing sites, and this season is just great for viewing, with the Summer Milky Way overhead and comfortable temperatures all night long. So, by all means, bring your family and come on out and enjoy the summer sky!

Starbecue – First August Star Party!

Along with other pleasures of summer viewing, we have a long-standing tradition of having a club potluck party at Anza at one of the summer star parties, which in recent years has usually been in July. This year, the July Star party is on the Fourth of July weekend, and we decided it would be easier for all concerned to have the annual potluck Starbecue at the first August star party, instead. So, mark your calendars – the 2008 Starbecue will be on August 2nd (there's also a star party on August 30).

Although Anza House has better kitchen facilities than the observatory, it isn't big enough inside for a full-scale Starbecue, and doesn't offer much in the way of outside shade in any area where we could hold the party. We therefore hold it in the parking area on the east side of the club observatory, which should have even more shade this year than in the past, as the observatory now has a higher roof. We set up the club's tables and any other tables people bring, and use them mainly for the food (most years we have a full table devoted to deserts, and a long table of all kinds of other food, all of it good). Unfortunately, there usually there isn't enough table space for people to eat at a table, but the up-side of that is that it makes people more mobile so they can move around and visit more. Anyone who wants to be assured of a seat brings a chair, as the club doesn't have many, but a lot of people seem to like to be on their feet during most of the party – it does make visits to the food tables and the barbecue easier!

The club provides sodas, plates, napkins and tableware. Everyone who comes brings a dish of their choice for 6 to 8 people, which can be something for the grill but doesn't have to be. Besides the barbecue, we have a microwave unit in the observatory warming room, and an outside electrical outlet if you need to plug in a crock pot or anything else to keep food warm. If you have any particular dietary restrictions, please feel free to bring your own food so you can be sure of having food within your restrictions, but do come join the party! And, if you've never been to Anza before, coming for the Starbecue is a great way to be introduced to our wonderful full-time viewing site!

We plan to start setting up the tables, etc., around 5:00, and will probably fire up the barbecue around 5:30 or 5:45. People generally start congregating around then, and we aim to start eating around 6:00, so we finish before dark,

when the star party starts in earnest. We'll have separate trash bags set up for recycleables, so please be sure when you finish a drink or you're ready to dispose of your plate that you separate trash from cans and bottles and get each into the right bag. We can always use help in setting things up and cleaning up afterward – if you can help us out, it would be very much appreciated. And, if any of whatever you bring for the potluck is left at the end of the Starbecue, please take it home with you, as we don't have any good way to make sure leftovers get used at Anza, and it would be a real pity to have good food go to waste! Not to mention the trash problem it creates…

The Starbecues are always a lot of fun – I look forward to seeing you all there!

How to Use Your Telescope Class

Twice a year we have our "How to Use Your Telescope" class as part of our Beginners Astronomy Class (it's the 5th of six sessions in each cycle of the Beginners Class). Under our normal schedule, this would be the first Friday of July – but that just happens to fall on the Fourth of July, so we had to move it to the last Friday in June, which is June 27th, at 7:30 p.m.

How To Use Your Telescope Class June 27th!

If you have a telescope that you don't know how to use or are having problems with, this class gives you the chance to get some hands-on help from our volunteers – bring your telescope and anyone in the family who might be interested in using it, and come on down to the Centennial Heritage Museum, 3101 West Harvard Street, Santa Ana. Harvard is about mid-way between Edinger and Warner, and the museum is a collection of Victorian buildings that's located about a half-block west of Fairview on the right as you go west on Harvard, not far from Centennial Park. You don't have to have attended any of the other sessions of the Beginners Class to come to this one. The class will meet at the back of the museum property, in the parking area. If you're bringing a telescope, you should park at the outside edge of the parking area, and set up nearby but toward the center of the parking area so you don't have to carry equipment as far.

If you have any knowledge about any type of telescope and can come out as a volunteer to help out, please do! If you have any questions about the class or what's involved, please contact me at btoy@cox.net.

And, if you're thinking of getting a telescope, this is a good class to attend to see a number of different models and see what's involved in setting them up, learn what kinds of problems people have been having with them, and (if the weather cooperates) see what it's like to view through different models – very helpful for deciding what kind of telescope you want for yourself.

This is a great session for both the people who come to learn and for the volunteers who come to help out. Whichever group you're in – I look forward to seeing you on June 27th!

Some Cool Websites…

A local Orange County writer, Chris Bahnsen, visited the Black Star Canyon star party at the end of April as he was working on an article for the *Orange Coast Magazine* about the club, particularly its star parties. He said he had a great time, and, as a follow-up, asked if we could recommend any websites he could include in the article that club members use for such things as Iridium Flares as well as other astronomical information. I think all of us have at least one or two astronomical sites that we visit regularly, but there are frequent additions and changes, and I thought this would be a good chance to update my information in that area. So, I put an inquiry out to the ocastronomers@yahoogroups.com email group – and they did come up with a nice collection. After I sent the suggestions to Mr. Bahnsen, I thought it would be nice to share them with all of you, as well.

Craig Bobchin sent the following sites that he uses on a regular basis:

Astronomy Magazine: http://www.astronomy.com
Sky and Telescope Magazine: http://www.skyandtel.com
Heavens Above (for satellite and Iridium Flare info): http://www.Heavens-Above.com
Astromart: http://www.Astromart.com
Spaceweather: http://www.Spaceweather.com

John Sanford also suggested Heavens Above, and added:

Astronomy Picture of the Day (APOD): http://antwrp.gsfc.nasa.gov/apod/astropix.html

Another person whose name I did not get suggested the Cal Sky site, http://www.calsky.com, and also recommended going to the "Astronomer level (near globe on right) to get all the information," which includes satellite information, Iridium Flares, tumbling Iridiums, International Space Station passes, and a lot more.

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AstroSpace Update

June 2008
Gathered by Don Lynn from NASA and other sources

Mars Reconnaissance Orbiter (MRO) – Examination of high-resolution MRO images showed that ice packs at least 0.6 mile thick, and perhaps as much as 1.6 miles, existed in Mars's mid-latitudes as recently as 100 million years ago, and that some glaciers flowed in the last 10 to 100 million years. This is recent enough geologically speaking that another such ice age could occur. Moraines (deposits of rocks pushed by past glaciers) on top of moraines were seen, which implies 2 or more separate glacial periods. It is thought that changes in the tilt of Mars over millions of years could have caused multiple ice ages.

MRO also observed the Martian **polar cap** with penetrating radar and found that the underlying rocky surface is not sagging the way Earth does under the weight of ice. This implies that the rocky material must be colder than thought in order to be that stiff. Also revealed were 4 zones of finely spaced layers of ice and dust separated by thick layer of nearly pure ice. Scientists think this pattern represents cycles of climate change on a time scaled of roughly 1 million years. Such climate changes are caused by changes in the tilt of the planet's axis and in the ellipticity of its orbit. The observations support the idea that the north polar ice cap is about 4 million years old.

Mars rover Opportunity has suffered stalling of the motor that moves its robotic arm at the shoulder joint. The first stalling of this motor occurred in November 2005, but since then the motor had worked ok by applying more voltage to it than normal. Rover controllers are studying whether the motor can continue to be used, and how the arm can be used if the shoulder is stuck in one position. Opportunity is crossing an inner slope of Victoria Crater to reach the base of a cliff called Cape Verde that forms part of the crater rim.

Mars Express (orbiter) has looked a few miles beneath the Martian surface using its MARSIS radar. The radar on MRO, using different frequencies, has determined Martian subsurface structure in greater detail, but not as deep. These successes are prompting scientists to think of other places where surface-penetrating radar could be used. Suggestions are Jupiter's moon Europa to see structure in the icy surface and the expected ocean below, Saturn's moon Titan to measure hydrocarbon lakes, Saturn's moon Enceladus to probe the geysers, and asteroids and comets to determine interior structure.

Cassini (Saturn mission) has observed a powerful electrical storm on Saturn that has lasted 5 months so far, the longest continuously seen storm on that planet. It has lightning bolts 10,000 times the power of bolts on Earth. Similar storms seen by Cassini in past years have lasted less than a month. No major storms had been seen for about 2 years before this one formed.

Titan dunes – An explanation has been presented of the source of the sand dunes seen on Saturn's moon Titan. It appears that the hydrocarbon snow that falls from the methane and ethane clouds gets sintered into larger particles, eventually reaching sand grain size. These then form the dunes seen on about 20% of the surface of Titan so far imaged. Sintering is the process where particles in contact with each other nearly melt and essentially weld themselves together. Once again, Titan appears like Earth, but the similar features are made of different materials at different temperatures than Earth.

Europa (Jupiter moon) – Study of images of Europa shows that the many long (more than 300 miles) curved depressions on the surface could have formed if the rotational pole of the moon has moved about 80 degrees. This could occur if a build-up of ice occurred at the poles, since spinning bodies tend to shift such that the greatest mass lies at the equator of spin. The shift would be easier to occur if the surface is floating on a liquid ocean, as is thought to be the case.

Jupiter rings – Scientists have explained a long-standing mystery regarding Jupiter's rings. There is a faint extension outward from what theory says should occur, and some particles have more inclined orbits than they should. Study of old particle impact data from Galileo shows that ring particles charge electrically and discharge according to when they are in the planet's shadow. Interaction of the charged particles with Jupiter's rotating magnetic field explains the unexpected shapes of the rings.

Messenger (Mercury mission) – Analysis of the flyby of Mercury in January has shown that the spacecraft deviated from its expected path slightly. Most of the deviation can be explained if there is a mass concentration (dense spot near the surface) about 10° south latitude and 60° longitude. Data from the next flyby should refine our gravity map of the planet. This will aid greatly in maintaining its observation orbit, to begin in 2011.

Mercury core – Experiments with iron containing sulfur at extremely high temperatures and pressures show that Mercury's core should contain 2 zones where iron snowflakes form. These flakes should sink toward the core, setting up convections that would produced a dynamo generating a magnetic field. This is the best explanation yet presented to explain why Mercury has a magnetic field, the only one among terrestrial planets other than Earth's.

Chandra (X-ray orbiting observatory) has measured the expansion of a supernova remnant seen in X-rays, but not visible light (due to obscuring dust), and found that the supernova must have occurred about 140 years ago. It is near the center of our Milky Way galaxy. Dust in that direction dims visible light by a factor of about a trillion. The most recent supernova known in the Milky Way was in about 1680, which resulted in the remnant known as Cassiopeia A, but may not have been observed when it occurred. Observations of other galaxies similar to ours show that they average about 3 supernovas per century. So astronomers have been trying to figure out whether the Milky Way is not producing its share of supernovas, or most of them are obscured from our view.

Now we know of a recent one that was obscured. It would require finding about 10 more obscured remnants younger than Cassiopeia A to show that the Milky Way is producing its share.

Supermassive black hole jet – An array of radiotelescopes has for the first time observed a knot of material ejected outward by a jet at the supermassive black hole at the center of a galaxy (BL Lacertae). The material was found to follow a corkscrew path, brighten at certain rotations, and flare when it hit a shock wave, all behavior predicted by the leading theory of how jets eject material. The polarization of radio waves and visible light also matched theory. That leading theory is that a twisted magnetic field is propelling the material outward in the jet. The galaxy name is of the form normally given to variable stars, since the object was thought to be a variable star for several decades before it was found to be an active galaxy.

Black hole merger – Computer models of 2 black holes merging predict that such an event should emit huge amounts of gravitational waves, primarily in one direction, which should cause the merged black hole to recoil in the opposite direction at high speed. The first such black hole moving away from its galaxy at high speed has been found. Its mass is several 100 million times the Sun's mass and it is moving 1650 miles per second relative to its galaxy. The black hole continues to accrete material into it, and this material gives off copious X-rays as it falls in. Those X-rays were what was observed, and the X-ray spectrum allowed its speed to be measured. It is so distant that its (X-ray) light took 10 billion years to reach us.

Compact galaxies – Observations made with the Hubble Space Telescope (HST) and various Earth-bound telescopes have found compact galaxies, ones with nearly the mass and number of stars as our Milky Way galaxy, but only 5% the diameter. The galaxies are so distant that we are seeing them as they were 11 billion years ago. Theory predicts that galaxies should have been somewhat smaller than comparable galaxies today, because the years since would include many galaxy collisions, where additional mass and stars would be accumulated. However, the sizes were even smaller than expected. These are much more massive than the small galaxies found in the Hubble Deep Field images (which existed even earlier in the Universe's history). The new observations show that roughly half of the massive galaxies were compact 11 billion years ago. Theorists will have to rework the galaxy formation and evolution theory to account for these compact galaxies.

Light echo from an X-ray flare has been observed in the center of a galaxy. A light echo occurs when a pulse of light reflects off interstellar gas, appearing as a ring that expands at the speed of light. The pulse of light was almost certainly caused by a star being ripped apart as it fell into the supermassive black hole at the center of the galaxy. Light echoes from supernovas have been seen before, but not from material falling into a black hole. As the echo expands, it will show the gas content of the regions swept over. The leading theory of active galactic nuclei predicts a molecular torus surrounding the accretion disk around the black hole. The spectrum of the light echo appears to show that this theoretical torus exists, the first time such a torus has been directly observed. The spectrum also indicated that the original pulse was from star material.

Another light echo – A team of astronomers using 4 orbiting X-ray telescopes has observed a light echo pass over a cloud of material 300 light-years from the supermassive black hole at the center of our Milky Way. Lots of observations were needed to rule out sources of X-rays other than light echo from the black hole. The observations spanned 10 years and showed how material must have fallen into the black hole over a period of a few years about 300 years ago (time measured in terms of light arrival at Earth – these events occurred at the center of our galaxy about 26,000 years ago, galaxy central time, since light took that long to reach us). Another light echo from the center of our galaxy was discovered last year, indicating material fell in about 50 years ago, but the newly discovered echo indicates the event 300 years ago was 10 times the energy of the one 50 years ago, and a million times the rate of activity now. It has been something of a mystery why our galaxy's black hole is billions of times quieter than black holes in some other galaxies. The new findings imply the activity occurs in fits, not steadily.

GALEX (orbiting ultraviolet telescope) in 2005 took an image of galaxy M83 that showed arms that extended beyond that seen in visible light. Now a follow up observation, with much longer duration, shows enormous numbers of bright young stars in arms that extend up to 140,000 light-years from the center (the visible arms extend only about 20,000 light-years). This means that formation of new stars is occurring in regions where it was thought the supply of gas out of which stars are made was too thin to support star formation. So the Very Large Array radiotelescope, which is sensitive to hydrogen gas, was used to look for the ingredients needed for stars at these large distances from M83. The concentrations of hydrogen in the radio observations were found to closely match the areas where young stars were seen in ultraviolet. It was suggested that the main body of the galaxy has not been able to spew substantial amounts of heavier elements created within stars out to the extended arms. So the newly discovered stars may well have formed in heavy-element-poor conditions, similar to the conditions found everywhere in the early Universe. If this is found to be true, study of this relatively nearby galaxy (15 million light-years away) may allow astronomers to understand how stars formed in the early Universe.

Iota Horologii – By studying the ringing of the star Iota Horologii (sound waves bouncing within it), combined with other observations, astronomers were able to calculate accurately its temperature (10,600° F.), mass (1.25 times the Sun), age (625 million years), and heavy-element content (50% larger than the Sun's). The age and heavy-element content matched the Hyades star cluster, indicating the star was born within that cluster, though it has now drifted 130 light-years from it. It is 56 light-years from us. Back in 1999 this star was found to have a planet. Astronomers have been arguing whether the correlation of high content of heavy elements and having planets means that heavy elements cause planets or that planets cause heavy elements. In the case of Iota, the heavy elements have remained unchanged from the cluster it formed in, favoring that heavy elements cause planets.

Oscillating white dwarf – White dwarf stars are the very dense left-over remains of Sun-like stars that have burned all of the nuclear fuel in their cores. 3 types were known, the last being discovered just last year: 1) those with an outer layer of hydrogen,

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OCA Plans Outreach Presentation at Hefner's Playboy Mansion

Pleiades Envisioned as Centerfold Background

By Gene Kent

When the night is black and the seeing good, to point your scope at the sky is like reaching out and touching the face of creation. For that single moment of euphoria, you have packed your Meade out to Anza over and over only to look at clouds, felt the sky shake with distortion, lost feeling in fingers so cold they can't feel the focus knob or be bled by mosquitoes. For some time now, OCA has been trying to provide a better way. That way is a **R**obotic **T**elescope (RT or, affectionately, aRTy).

Arty is a Meade 12-inch LX200 telescope connected to a computer controlled via an internet connection. The attached cameras can provide color and the opportunity to stack images to provide a cheap alternative to adaptive optics. The control via the Internet connection can be from as close as Anza House or as far away as Pakistan. The real-time image could be displayed on your home computer or at a school auditorium. If the sky over Anza clouds over or the seeing is bad, not a drop of gas need have been lost driving to Anza.

I suggest that Arty could be OCA's finest asset. Imagine an outreach program at the local Junior High. The children prepare in their class the week before to identify the Orion constellation. They learn of M42. They know what a nebula is. Then at their own command, with but a wee bit of help from a proctor, they direct Arty to that pink and lavender flowering mass of hydrogen and dust. They have done it. They have touched the sky.

Arty in fact exists, but it is in a terrible state of disrepair. The Deep Space Imager (DSI) camera used on its finder scope died two months ago. The Meade 416 camera attached to the guide scope is antiquated, slow and extremely difficult to focus. Arty's main "eye" is a Cannon digital SLR camera on loan with limited software to run it. The Meade software used to direct Arty around the sky has some severe problems. The internet server that provides the connection to control Arty has been notoriously unreliable. And most limiting of all, Arty has but a few friends capable of helping it do what is truly envisioned.

The Moon as imaged by Arty 4/8/08) -- a fitting 'cen

JV Howell, a fighting pit bull dog trainer, and Gene Kent, a toilet seat designer, are Arty's two best friends. They are hardly the two best choices to attend to Arty's needs. Yet, they have steadfastly

A 30-second exposure of M9 taken by the new Remote Telescope (the telescope formerly known as MOCAT).

worked through one breakdown after another. They rebuilt the RA and declination gears. They have trucked the scope back and forth from Anza to Meade's factory in Irvine at least three times in the past two years. They have mounted and re-mounted finder and guide scopes to which they attached a variety of cameras. Bless their hearts. They have done their best for the abused, underappreciated Artie, and they need help. The list of needs to make Arty really function are:

1. A good CCD camera for the LX200 with intuitive software (probably $1700 to $3000);

2. A simple CCD camera for the finder scope that ideally could be directed by the same software that runs the CCD camera on the LX200 ($800 to $1200);

3. Yet another camera for the guide scope ($800 to $1200);

4. Software – (A) to hold the scope on a guide star; (B) control multiple cameras simultaneously; and (C) process the images ($500+);

5. A few young women astronomers with experience and expertise in using CCD astro cameras, telescope driving software and preparing good meals (actually the gender, age and cooking skill is not mandatory – but Arty does like pretty girls);

6. Engineering and building a means to open and close the observatory roof by commands over the Internet (cost unknown).

Admittedly, a 12-inch Meade in a small clamshell-style observatory next to Anza House does not compare to the 200-inch at Palomar Mountain, but only the few chosen researchers are permitted access to such instruments. There is something breathtaking about controlling a telescope yourself for real-time observation or taking your own images that surpasses looking at superior pictures taken at Palomar Mountain or even the HST. To share that reality with the world is an awesome opportunity for OCA. If you are interested in helping to make Arty all that it can be, and to share what Arty can do with students and others in Orange County and the rest of the world, please contact JV Howell at jvhowell@cox.net, Gene Kent at kenthouse@cox.net or Del Christiansen at DelmarChris@earthlink.com.

(.032 second single exposure, terfold' for Gene's article!

Yeah, yeah, I know. The Playboy centerfold thing was just a ruse to get your attention.

M-11 taken through Arty with 30-second exposure

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2) those without hydrogen, having helium in the outer layer, 3) those with carbon in the outer layer, having lost their hydrogen and helium. It is thought that only the most massive stars to form white dwarfs result in the carbon type. A group of astronomers had predicted that some carbon white dwarfs should oscillate, due to carbon ions becoming neutral in waves. This 4th type, an oscillating carbon white dwarf, has been found as a star about 800 light-years away in Ursa Major. It varies regularly by 2% in brightness every 8 minutes.

Strange binary star – Millisecond pulsars, those that rotate so fast that their beacon flashes by every few milliseconds, are typically found to be binary stars in quite circular very small orbits. This is explained by the fact that material falling on the pulsar from its very close companion is what spins such pulsars up to tremendous speeds. And forces involved in this situation tend to change such an orbit from elliptical toward circular. A pulsar called J1903+0327 was found in 2006 which follow-up observations have shown to be spinning 465 times per second (definitely in the millisecond class) and it is in a highly elliptical orbit about its companion. How it can remain elliptical is baffling scientists. Also, the companion star is Sun-like, not typical for a millisecond pulsar companion, and the pulsar's mass is unusually high. Now they are really baffled. One possible explanation is that the system is actually a triple star, but that the third has not been found yet. Additional observations will be made to shed light on this strange system.

Unusual quadruple star – A quadruple star has been discovered, 2 close pairs in turn orbiting each other, in a region smaller than Jupiter's orbit. This is too small for the stars to have formed from 4 separate gas clouds collapsing, so they possibly formed from one cloud that fragmented during star formation for some reason. The system has long been known, thought to be a single star, but was just recently found by spectroscopic observations to consist of 4 stars. One pair orbits every 2.5 days, and they are 14 times closer than Earth is to the Sun, while the second pair is 4 times closer (that Earth-Sun), taking 55 days to orbit. The closer pair eclipses each other, so the size and mass of each has been calculated from the eclipse observations. They are nearly identical at 60% the diameter of our Sun.

Universe – Astronomers have made a computer model of dust distribution in the Universe that matches observations in various wavelengths of light. It shows that half of the light produced in the Universe is absorbed by dust. This varies with tilt of galaxies to our line of sight, but averages to half. So conversely, the Universe is twice as bright as we can see. They calculated the average brightness before absorption is 5 quadrillion watts per cubic light-year.

Swift (gamma-ray burst satellite) observed in late April the brightest flare ever seen coming from a normal star, other than the Sun. The source was a variable star named EV Lacertae, an ordinary red dwarf star that normally appears magnitude 10, but was briefly during this flare bright enough to have been seen naked eye. It is 16 light-years away, but shines with only 1% of the Sun's light, typical for small-mass stars like red dwarfs. When Swift detected the flare with its X-ray telescope, it automatically turned its ultraviolet (UV) telescope toward the object. But the UV telescope was overloaded by the brightness, and shut itself off. High levels of X-rays continued for 8 hours. The star rotates 7 times as fast as our Sun, which causes its magnetic field to be over 100 times the strength of the Sun's field. It is believed that this powerful magnetic field produces flares so bright.

Rossi (X-ray orbiting observatory) has made observations of an erupting neutron star, where material falling on it eventually ignites in a burst. It was found that the frequency of X-ray pulsations slows steadily. When it reaches 1 cycle every 125 seconds, then a burst occurs. The astronomers are observing 50 other similar stars to see if the same behavior happens. If so, then timing the X-rays could be used to predict the bursts, which seem to occur at somewhat random intervals.

SOHO (orbiting solar observatory) has observed that powerful starquakes ripple around the Sun immediately after large solar flares explode above the surface. The correlation in timing is so strong that there is no doubt the flares are causing the ringing quakes. Now theorists have to work to understand the mechanism by which the flares cause the oscillations. The discoverers suggest that looking for similar oscillations within other stars could allow determination of the strength of flares.

Asteroid impacts – A new technique has been developed to calculate the size and time of asteroid impacts. The technique uses measurements of isotopes of osmium, which differ in the ratio found in asteroids than found on Earth. These are measured in ocean sediment, which is then dated by usual geological means for sediment layers. The concentrations of osmium tell how large the asteroid was, even if measured far from the impact point, because osmium tends to distribute about all oceans before settling in sediment. The new method applied to 65 million year old sediments indicates the asteroid that hit Earth then was in the range of 2.5-3.7 miles across. The osmium method can be applied in addition to the iridium method that was used previously.

International Space Station (ISS) – NASA has contracted with the company (Hamilton Sundstrand) that makes space suits and other equipment used on ISS to turn waste carbon dioxide in ISS into water, using a process involving hydrogen. Tests are scheduled for 2 years from now. Methane will also be produced, which will be vented to space. This will reduce the need to bring water to ISS aboard the Shuttle and Russian and European unmanned supply ships. Already about half of ISS's water is produced by treating and then reusing waste water. The contract is for water supply, not for equipment, so the company will be paid only when the system works.

Soyuz – On April 19 a Russian Soyuz vehicle brought a crew of 3 back to Earth from ISS, and for the second consecutive time a Soyuz switched to its unguided backup mode, used when the onboard computer locates failure of some component. It is believed that the failure detected was that the module with rocket engines and solar panels did not jettison properly from the crew-carrying

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Lorna Pecoraro sent the "Stars" site, www.astro.uiuc.edu/~kaler/sow/sowlist.html and said:

It was created by James Kaler, Prof. Emeritus at the U. of Illinois and, literally, has everything you ever wanted to know about stars! Just click on the picture of the observatory and you will get to the main page. The "Places To Go" section is the starting point for information on many topics. Continue to scroll down and you will see the section on the individual stars. Each one contains history, name(s), and some interesting info about the brightest stars. The site is continually updated. My instructor listed it as one of the 'textbooks' for an astronomy class I took recently. He claimed it was the best source of information about stars and it was!

Jim Benet suggested the website of the Astronomical Society of the Pacific for educational information: the main website is http://www.astrosociety.org/, and the page dealing specifically with education is http://www.astrosociety.org/education.html.

At the last GoTo SIG meeting, Craig told me about an interesting free planetarium program he had recently found, Stellarium (for information and download: http://www.stellarium.org/; as the website says, this is not related to stellarium.com, which produces star map displays for museums). A unique feature of this program is that you can set it to show constellations as seen by several other cultures. Craig was also the first person who told me about Cartes Du Ciel (http://www.stargazing.net/astropc/), which is another free planetarium program that allows you to produce star charts, among other features.

My thanks to everyone who sent suggestions, and I hope you find these links useful!

And those who get the *Orange Coast Magazine* – please look for the article on the OCA and the Black Star Canyon star party!

ABOUT OUR SPEAKER

Aaron Barth has a Ph.D. in astronomy (1998) from UC Berkeley. He held postdoctoral positions at the Smithsonian Observatory and then at Caltech, and came to UCI in 2004 as an assistant professor. His research is centered around observational studies of black holes in galaxy centers, and uses data from the Keck Observatory, Lick Observatory, the Hubble Space Telescope.

ABSTRACT FOR THE JUNE PRESENTATION

Supermassive black holes are now known to be present in the centers of most (and possibly all) large galaxies, and the growth of these black holes can have important consequences for the formation and structure of the galaxies they inhabit. In active galaxies and quasars, the central black hole is swallowing up surrounding material, and the gas falling toward the black hole is a source of tremendous luminosity. Dr. Barth will describe a monitoring project for nearby active galaxies being carried out this spring at Lick Observatory near San Jose. We are taking imaging and spectroscopic data every night over a 65-night period in order to monitor the variations in the brightness of 13 galaxies, to examine the structure of the black hole's immediate environment in each galaxy and to measure the black hole's mass. The results will be used to help calibrate techniques that are used to estimate black hole masses in very distant quasars.

FOR SALE: Starmaster 10" EL f5 with Zambuto optics and full Argo Navis computer, with encoders. This is a great portable scope, sets up in minutes. The mirror is in excellent shape and comes with certifications,this Zambuto mirror is a 10"f5, S/N SM10-027, with a strehl ratio of 0.986, so a premium mirror. Also included is a laser collimator, JMI focuser, Rigel Quickfinder, Argo Navis computer with encoders installed,data cables, and a pc cable to update the Argo Navis catalogs. The scope is in like new condition, the wood is in perfect shape and the mirror is in perfect shape, two wooden dust covers and a cap cover for the secondary are included. This scope has been kept indoors and covered and was hardly used. That is why I am selling it. I am asking $3000 delivered or best reasonable offer. Pics can be seen at http://www.pbase.com/snowlep/starmaster. I can be reached on my cell at 818-237-6293 or email at asmallbone@earthlink.net Thanks for looking.

NASA's Space Place

Ozone, the Greenhouse Gas

We all know that ozone in the stratosphere blocks harmful ultraviolet sunlight, and perhaps some people know that ozone at the Earth's surface is itself harmful, damaging people's lungs and contributing to smog. But did you know that ozone also acts as a potent greenhouse gas? At middle altitudes between the ground and the stratosphere, ozone captures heat much as carbon dioxide does.

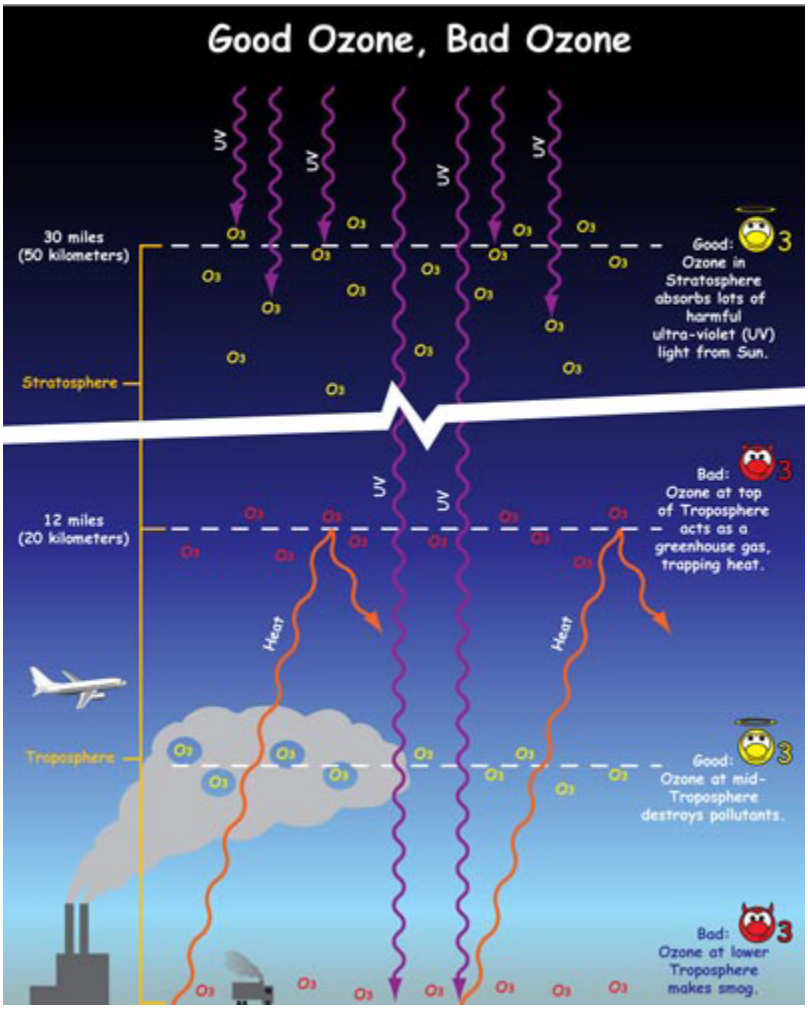
In fact, pound for pound, ozone is about 3000 times stronger as a greenhouse gas than CO_2. So even though there's much less ozone at middle altitudes than CO_2, it still packs a considerable punch. Ozone traps up to one-third as much heat as the better known culprit in climate change. Scientists now have an unprecedented view of this mid-altitude ozone thanks to an instrument aboard NASA's Aura satellite called the Tropospheric Emission Spectrometer—"TES" for short.

Most satellites can measure only the total amount of ozone in a vertical column of air. They can't distinguish between helpful ozone in the stratosphere, harmful ozone at the ground, and heat-trapping ozone in between. By looking sideways toward Earth's horizon, a few satellites have managed to probe the vertical distribution of ozone, but only to the bottom of the stratosphere.

Unlike the others, TES can measure the distribution of ozone all the way down to the heat-trapping middle altitudes. "We see vertical information in ozone that nobody else has measured before from space," says Annmarie Eldering, Deputy Principal Investigator for TES.

The global perspective offered by an orbiting satellite is especially important for ozone. Ozone is highly reactive. It is constantly being created and destroyed by photochemical reactions in the atmosphere and by lightning. So its concentration varies from region to region, from season to season, and as the wind blows.

Data from TES show that ozone's heat-trapping effect is greatest in the spring, when intensifying sunlight and warming temperatures fuel the reactions that generate ozone. Most of ozone's contribution to the greenhouse effect occurs within 45 degrees latitude from the equator.



Ozone behaves differently at different altitudes in the atmosphere. High in the stratosphere and at mid-troposphere it has positive effects on life at the surface. At the top of the troposphere ozone is a greenhouse gas and at the surface it makes smog.

Increasing industrialization, particularly in the developing world, could lead to an increase in mid-altitude ozone, Eldering says. Cars and coal-fired power plants release air pollutants that later react to produce more ozone. "There's concern that overall background levels are slowly increasing over time," Eldering says. TES will continue to monitor these trends, she says, keeping a careful eye on ozone, the greenhouse gas. Learn more about TES and the science of ozone at tes.jpl.nasa.gov/. Kids can get a great introduction to good ozone and bad ozone at spaceplace.nasa.gov/en/kids/tes/gases.

This article was provided by the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration.

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compartment. The result of an unguided entry is more (but endurable) force on the occupants (8.2 times that of gravity in this case) and landing nearly 300 miles from the pickup crew. It apparently caused the spacecraft to hit the top of the atmosphere backwards, scorching the hatch and radio antenna, before flipping with the heat shield properly forward. The craft is built to withstand such entry, but it is worrisome that it happened twice in a row. Of course an investigation is underway to prevent it from happening again. The Soyuz vehicle has 99 consecutive safe re-entries and so is considered quite reliable. After landing, cosmonaut Malenchenko freed himself from his harness, despite the craft not being upright, and within a half hour was able to use a satellite phone to summon the pickup crew.

Astronaut Peggy Whitston, returning to Earth on the Soyuz, had just set the **record** for total time in space for an astronaut, 377 days. This broke Mike Foale's record of 374 days. Her spacecraft mate, Malenchenko, completed 515 days in space, which is only ninth place among cosmonauts. That reflects the years of Soviet/Russian experience with long stays (typically 6 months at a time) aboard the Mir and Salyut space stations. The third Soyuz passenger, So-yeon Yi, was in space only 11 days, but that set the record for a South Korean.

Pioneer anomaly – It has long been known that the Pioneer 10 and 11 spacecraft both fell slightly behind in their predicted paths as they headed out of the solar system after encountering Jupiter and Saturn. An effort was recently made to save and update all data regarding the Pioneers, as it was on obsolete magnetic media that were to be scrapped. Study of this has just begun, using a computer simulation of the spacecraft. Preliminary results of this indicate that heat distribution, chiefly due to heat conducted from the radioactive electric generators, causes a slight force due to radiation of that heat to space. This force appears to explain about 30% of the anomaly for Pioneer 10. Study of more data and computer simulation of other spacecraft properties will continue, perhaps for years. Many scientists would really like to know whether the anomaly is due to ignored small effects, like this heat distribution, or due to deviations from Einstein's gravitational theory. Why have only these 2 spacecraft shown this position anomaly? Because only 4 spacecraft have ever ventured beyond Saturn, where the Sun's gravity is becoming a weak factor, that have been tracked for decades. The other 2 (Voyagers), use attitude control jets that occasionally fire, introducing uncertainty factors larger than the Pioneer anomalies.

LCROSS – In 2006 it became apparent that the Lunar Reconnaissance Orbiter (LRO) was going to be considerably heavier than planned, so it was decided to switch to a more powerful launch rocket, the Atlas 5. But that had more power than needed, so it was decided to build another lunar mission and launch it piggyback on LRO to use the extra capability. The piggyback mission is named LCROSS. Its mission is to crash its upper stage rocket (actually LRO's upper stage) into a permanently shadowed crater, then fly the spacecraft through the cloud of debris, analyzing its content, hoping to find water ice. Unfortunately such a trajectory for the spacecraft results in it also crashing, a few minutes later. So all data will be radioed to Earth before impact. Since many Earth-bound and orbiting telescopes will also analyze the rocket crash debris, they will watch a few minutes longer and analyze the spacecraft crash too. LCROSS is using proven designs from other spacecraft in order to achieve the very short schedule (and tight budget). LCROSS has 5 cameras, 3 spectrometers and a photometer. It is estimated that the rocket impact will create a crater about 100 feet across and 16 feet deep, throwing up 2 million pounds of debris.

Instant AstroSpace Updates

The **Lunar Reconnaissance Orbiter** will be delayed a few weeks from its scheduled launch October 28. It will map in high resolution possible human landing sites, evaluate radiation hazards, search for ice in permanently shadowed regions, and measure the surface temperature.

Venus Express has detected the molecule **hydroxyl** high in the atmosphere of Venus, the first detection on a planet other than Earth. The concentration varies considerably with time, and is probably linked to ozone concentrations, as it is in Earth's atmosphere.

Decades of **Saturn** observations were analyzed to show that a band over the equator and those on either side oscillate in temperature and wind direction every half Saturn year (about 14 Earth years). Earth has a similar oscillation that takes 2 years.

Phoenix is scheduled to land on Mars May 25 at a far northern latitude. Its mission is to dig into the soil, known to contain considerable ice, and analyze the material scooped up.

An analysis of the brightnesses and colors of red giant stars in the colliding galaxies known as the **Antennae** (NGC 4038-9) indicates that they are about 45 million light-years away. Previous estimates by other methods yielded 65 million light-years. ■

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