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The Newsletter of the Orange County Astronomers

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As this issue is being assembled during the Winter Solstice, this picture taken just prior to the Summer Solstice at Chaco Canyon, New Mexico seemed appropriate. On the solstice, the shaft of sunlight illuminates the niche (at left) in the wall of the kiva. Photo by Larry Adkins.

OCA CLUB MEETING

The free and open club meeting will be held Friday, January 12th at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. Be sure to join us for Astronomy Jeopardy!

Next General Meeting: February 9th

STAR PARTIES

The Anza site will be open this month on January 20th. The Black Star Canyon site will be open this month on January 27th. 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, January 5th (and next month on February 2nd) at the Centennial Heritage Museum at 3101 West Harvard Street in Santa Ana.
GOTO SIG: TBA (contact coordinator for details)
Astrophysics SIG: Jan. 19th, Feb. 16th
Astro-Imagers SIG: Jan. 16th, Feb. 20th
EOA SIG:Jan. 24th, Feb. 28th
Dark Sky SIG: TBA (contact coordinator for details)

President's Message

By Barbara Toy

Well, 2006 is now behind us and I hope that it was a year that brought all of you more good times than bad, and that you are much better off at the end of the year than you were at the beginning. 2007 is now upon us, and this is the time of year when we all feel hopeful about what the new year has in store for us. I certainly wish you and your loved ones all of the very best in the New Year!

Of course, January also marks the beginning of true winter, when temperatures tend to hover in the 30s most observing nights, and can even get down to the 20s or below on occasion. The compensation, of course, is the wonderful array of wintertime objects to view and/or image. As I've said before, winter viewing can be really enjoyable when you are properly prepared. Fortunately, there are many helpful products to keep you comfortable during those long cold nights, and I hope you'll take full advantage of them so you can really enjoy the winter skies.

The OCA Election, and a Sad Farewell to 2006 Trustees Matt Ota and Leon Aslan

As a reminder – January is when we elect the new Board of Trustees for the coming year. You should find a ballot in the January issue of the Sirius Astronomer, or you can download one from the website, or get one at the January general meeting. Statements provided by the candidates should also be posted on the website. You can send in your ballot at any time before the January general meeting, which is January 12, 2007. The specific directions (including the mailing address) are on the ballot itself, and the process is quite easy, so please do vote! And, although you can vote at the January meeting, it's a good idea to vote by mail well before then, so you can be sure your ballot gets to Bob Evans in time even if you're unexpectedly unable to make it to the meeting.

The election of the new Board generally means that we have to say goodbye to Board members who are not returning, and this year is no exception. Having new Trustees join the board each year is good for the Board and for the club as a whole, as it brings in new perspectives and energy, but it is always sad to say goodbye to those who are not coming back as Board members. At this point, we already know that Matt Ota and Leon Aslan will not be rejoining us in 2007, as they both had too many other commitments to allow them to serve on the board for another year and so decided not to run again.

Matt has been one of our regular volunteers in the outreach program for many years now – that's where I first got to know him – and, when he was living in Orange County, he was also a regular participant in our GoTo group, our astrophysics group and our AstroImaging group. He's a designer of business signs by trade, and has been very generous to the club over the years in using his skills and connections to get us such things as banners for the AstroImage Conferences, the informational signs that are posted in several areas at our Anza site, and the Anza site maps that are posted in club observatory and at Anza House. These maps are particularly helpful, as they allow people to locate specific observatories and pads on the site and identify the responsible licensee, which helps when someone wants to confirm that a particular pad will be available for use or when there is a condition on a particular pad or observatory that should be brought to the licensee's attention. We have needed something like this for a long time, but nobody was able to come up with a workable way to do it until Matt came up with his design, and also came up with a way of mounting them that allows us to update the maps pretty easily as needed.

Besides his OCA activities, Matt has been an active volunteer at Mt. Wilson, particularly with the Telescopes in Education (TIE) program in the past, and now with running the 16-inch telescope that is located in a small observatory near the 60-inch. He recently moved to LA County, and has become an active member of the South Bay Astronomical Society – even though he tells me his primary loyalty will always be to OCA, I know he's doing good work with the South Bay group and on Mt. Wilson, and it's not surprising that he is finding himself so busy with these other activities that he has had to cut back on some of his OCA activities, including participation on the Board. We will certainly miss his enthusiasm and willingness to take on new projects!

Leon has been very active in the AstroImaging group – for a time he was co-chair of the group with Bill Patterson. He also spends a lot of time at Anza and is very familiar with the site, and he has experience as both a pad licensee and an observatory licensee, so he brought useful insights to the 2006 Board. However, besides working a full-time job, he started his own business a couple years ago making astronomical fittings and accessories, and that business has grown substantially over the last year. We're very lucky that he was both willing and able to devote a year to serving on the Board in 2006, and we will miss his unique perspective as well as his sense of humor on the 2007 Board.

We want to thank both Matt and Leon for their participation on the Board and their ongoing activities as active members of OCA, and we wish them both the best of luck in their future endeavors!

OCA on Mt. Wilson

Several months ago, the OCA AstroImage SIG decided to arrange for two or three nights on the 60-inch telescope at Mt. Wilson, with the cost of each night to be shared among the participants who signed up for that night. Dick Greenwald generously volunteered to make the arrangements and to coordinate these nights. There were originally three nights that were decided on by the group, and the plan was to limit the number of people in each group so each person in the group would have more time at the eyepiece – most of the people who signed up for this from the AstroImage group were interested in trying to capture images through the 60-inch, which would take more time per person than if they were just using the telescope visually.

Well, the first night got clouded out, and the second night was canceled due to the fires in the vicinity. The third night, which was in November, was a rousing success, and several people on the trip managed to bring back some very interesting pictures taken through the 60-inch. These really whetted the appetites of those of us who were signed up for the last available trip in 2006 (which was added on when the first two were cancelled), on December 16. I was one of the people scheduled to be on that trip, and I heard a lot of plans being made for using different equipment to improve on the images that the November group captured – videocams for Saturn, and other cameras for nebulas, galaxies, etc. From the November pictures, even very short exposures with hand-held digital cameras were capturing some amazing details in such objects as the Blue Snowball, and everyone was really looking forward to capturing even more. Those of us who weren't planning on imaging were really looking forward to the great views you can get in the 60-inch, which bring out unexpected detail in even familiar objects (such as those beautiful inner rings and the central star in the Blue Snowball, which is generally a blue disk in smaller telescopes, even the Kuhn)

As the week leading up to December 16th advanced, the weather got worse, and the trip finally had to be cancelled. This, alas, is part of our regular experience as astronomers…ours is a hobby that is often victimized by bad weather, though many of us have been known to head out to our favored viewing areas in spite of bad forecasts, in hopes that the forecasts are wrong. In this case, they weren't, as the winter storm that was forecast came through that Saturday and brought wind, rain and heavy clouds with it. Fortunately, when a night on Mt. Wilson is called off because of weather (or fire), the group can either reschedule or their money is returned.

Those who were at the December meeting may recall that Dick Greenwald gave us a very nice presentation about the nights that were planned for Mt. Wilson, and particularly the very successful visit in November (complete with some of the pictures that were taken through the 60-inch). It's too bad we had such bad luck the other nights, but Dick has volunteered to set up some additional OCA nights in 2007. If any of you are interested in joining a group of fellow OCA members for a night on the 60 inch in the coming season, please contact Dick Greenwald, or send me an email and I'll send it on to Dick.

During the time I've been in the club, there have been a lot of suggestions about the club organizing nights when groups of members could use the 60-inch, but nobody has been willing to take on the job of organizing these events before Dick Greenwald stepped in. We really appreciate his efforts, and hope that all of the nights he's able to organize in 2007 will be like the November trip in 2006!

Recent Developments on the Club Observatory:

As I write this, Dave Radosevich has just emailed the Board to let us know that work has actually started on the replacement of the observatory roof. The current plan is to start with replacing and reconfiguring the flat roof over the warming room (which is an asphalt roof that I understand hasn't been replaced since the observatory was built and is in understandably poor condition), replacing the badly-weathered structure that supports the moving roof when it's open with a steel support structure, and then to start the work on the moving roof itself after the weather improves in the spring. Dave has generously donated money to help fund the project, and, even more importantly, is donating his time, energy and expertise to move the project forward, for which we are very grateful indeed. Besides Dave, Jim Hannum, Gary Schones and John Kerns are heavily involved in this project, and we are very grateful for the work that all of them are doing.

As the project moves along, I'm sure that help from other club members will be very much appreciated; if you can help out, please let Dave, Jim, Gary or John know, or send me an email and I'll be happy to pass that through to them (btoy@cox.net). And, if you happen to be out at Anza and see that people are hard at work on the observatory and you could put some time into helping – please do offer to help with whatever they might need!

Vance Tyree recently put in a temporary line so that the access point for the Anza on-site network located at the observatory

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AstroSpace Update
January 2007
Gathered by Don Lynn from NASA and other sources

Dark Energy – The Hubble Space Telescope (HST) has measured the distances to 2 dozen very distant type Ia supernovas in order to measure the expansion of the Universe back to earlier times than measured before. Analysis of the new data showed that dark energy, the unknown agent that is speeding up the expansion, had a measurable effect at least as long ago as 9 billion years. Previous studies showed that the expansion began accelerating 5 to 6 billion years ago, as dark energy began to have a greater effect than gravity, which slows the expansion. The new data shows that dark energy was present long before this, but was overwhelmed by gravity until the Universe lost density sufficiently to drop gravity's effect to be smaller than that of dark energy. This tends to support theories of dark energy where it is an inherent property of empty space, and does not change strength with time. The formula that Einstein wrote that had a repulsive force (called the cosmological constant then) was of this form. He later withdrew the formula, calling it his biggest blunder, since there was no evidence for a repulsive force at that time. The first evidence was found long after Einstein's death. The HST study also showed that supernovas 9 billion years ago had the same properties as today's.

Fastest spinning black hole has been found using the Rossi X-ray Timing Explorer satellite. This is only the 3rd black hole ever for which the rate of spin has been measured. It has a mass of 14 times the Sun and is spinning 950 times per second. This puts the rotational speed of the event horizon at least 82% the speed of light. The technique used to measure the spin was to take the X-ray spectrum of the material in the accretion disk, on its way to falling into the black hole. From the brightness and shape of the spectrum, the size of the accretion disk can be calculated. There is a theoretical relation between the spin of the hole itself and the size of the accretion disk, which allows calculating the spin. There is sufficient material in the accretion disk to make the X-ray measurements because the black hole is orbiting a companion star, and pulling material off that companion. The discoverers believe that the high spin of this black hole is a product of how the star collapsed when the black hole formed. Thus this black hole has always spun this fast.

New particles – Scientists using the Tevatron particle accelerator (currently the most powerful) at the Fermilab in Illinois have discovered 2 new baryons, named $\tilde{}_b$ (Sigma sub b). Baryons are composed of 3 quarks bound together. Protons and neutrons are the only well-known baryons, though scores of them are known. The 1st new particle contains 2 up quarks and a bottom quark, and the 2nd 2 down quarks and a bottom quark. A proton is 2 ups and a down. The new particles are fairly rare, and decay immediately into other particles. Smashing 100 trillion particles together produced only 240 $\tilde{}_b$ particles. They are the most massive baryons known, heavier than a helium atom, but lighter than lithium. All the baryons were probably produced minutes after the Big Bang, but all decayed soon except the protons and neutrons that today compose nearly all the ordinary matter of the Universe.

Nearby stars discovered – Astronomers using small telescopes at Cerro Tololo in Chile have been using the parallax technique to measure the distances of stars in hopes of finding more nearby stars. They announced discovery of 20 more stars within 32 light-years of us. This group and another group had previously announced 14 other nearby stars since 2000. Their goal is to find all stars and brown dwarfs (objects not massive enough to support the nuclear fusion that lights ordinary stars) within this distance to gather statistics on their distribution by mass, age, and binary (or multiple) state. They expect to find more neighbors as their search continues. Of the currently known neighbors, 69% are red dwarf stars, even though not a single red dwarf star is bright enough to be seen with the naked eye. The 20 new ones are all red dwarfs, though this group has found a few white dwarfs in the past. All the recent finds have been stars too dim to have been noticed in previous searches for nearby stars.

Negatively charged molecules – Until now, all of the more than 140 molecules detected in space have been neutral or charged positively. The first negatively charged molecule, C_6H^-, has been identified from radio signals observed by the Byrd Telescope in West Virginia. The rarity of negatively charged molecules is believed to be caused by ultraviolet light from bright stars knocking electrons off molecules, making them positively charged, or neutralizing them if they were already negatively charged. The new molecule is one of the largest known in space, and this may contribute to its stability in spite of the effects of ultraviolet.

Cassini (Saturn mission) has been using gravity slingshots by Titan to change its orbit so that it passes Saturn nearer its poles. On a recent pass it got a good look at the south pole, and imaged the vortex in the clouds there. Surprisingly, it differed from vortices at the poles of other planets in that it has spiral arms, an eye and a wall of clouds about the eye, like an earthly hurricane. The eye is a hole deeper into the clouds, with the bottom formed by clouds darker than other Saturnian clouds, so probably have different chemistry. The atmosphere is descending into the eye. Winds outside the eye were measured at up to 350 mph. The south pole was already known to be slightly warmer than surroundings, and Cassini measured temperatures with better resolution than before. The pole was found to be 4 degrees F warmer than nearby areas. The spacecraft will continue to monitor the polar region to see if it changes with the seasons, as southern Saturn is moving from summer toward fall.

Cassini imaged a **mountain range on Titan** nearly 100 miles long and almost a mile high, the tallest mountains yet seen on this moon of Saturn. The mountains are probably made of icy material, but hard as rock due to the low temperatures there. The mountains probably formed from material welling up from below to fill a gap opened when tectonic plates pulled apart, similar to mid-ocean ridges formed on Earth. Clouds near the mountainous terrain are probably methane droplets that form when the atmosphere cools as it is pushed over the mountains by winds. In addition to the mountain range, dunes and a deposit of material that resembles a volcanic flow were found on this flyby of Titan. There is a circular feature near the apparent flow that is looking increasingly like it is a volcano.

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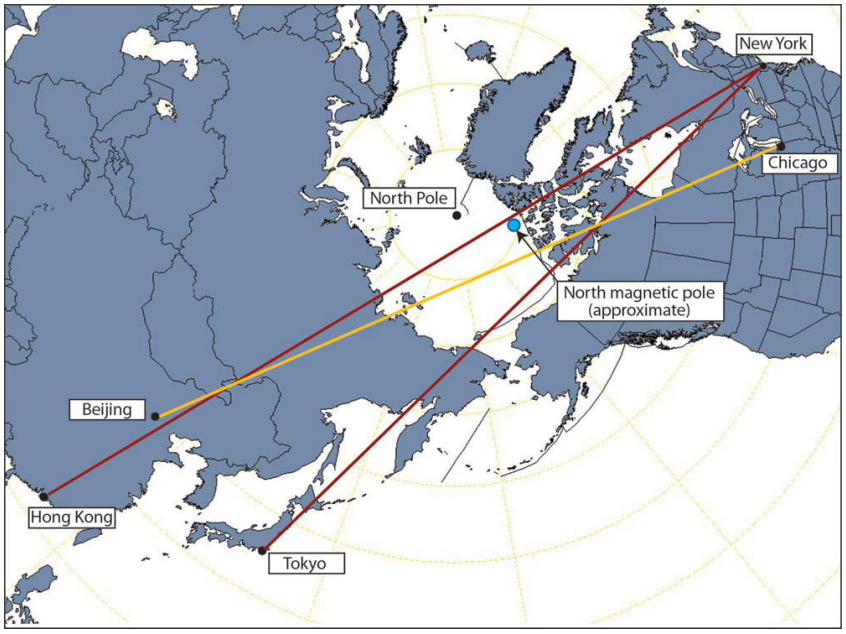
NASA's Space Place

Space Weather for Air Travelers
By Dr. Tony Phillips

At a time when much of the airline industry is struggling, one type of air travel is doing remarkably well: polar flights. In 1999, United Airlines made just twelve trips over the Arctic. By 2005, the number of flights had grown to 1,402. Other airlines report similar growth.

The reason for the increase is commerce. Business is booming along Asia's Pacific Rim, and business travel is booming with it. On our spherical Earth, the shortest distance from Chicago to Beijing or New York to Tokyo is over the North Pole. Suddenly, business travelers are spending a lot of time in the Arctic.



The shortest airline routes from the Eastern U.S. to popular destinations in Asia go very near the magnetic North Pole, where space weather is of greatest concern.

With these new routes, however, comes a new concern: space weather. "Solar storms have a big effect on polar regions of our planet," explains Steve Hill of NOAA's Space Weather Prediction Center in Boulder, Colorado. Everyone knows about the Northern Lights, but there's more to it than that: "When airplanes fly over the poles during solar storms, they can experience radio blackouts, navigation errors and computer reboots—all caused by space radiation."

In 2005, United Airlines reported dozens of flights diverted from polar routes by nasty space weather. Delays ranged from 8 minutes to nearly 4 hours, and each unplanned detour burned expensive fuel. Money isn't the only concern: Pilots and flight attendants who fly too often over the poles could absorb more radiation than is healthy. "This is an area of active research—figuring out how much exposure is safe for flight crews," says Hill. "Clearly, less is better."

To help airlines avoid bad space weather, NOAA has begun equipping its GOES weather satellites with improved instruments to monitor the Sun. Recent additions to the fleet, GOES 12 and 13, carry X-ray telescopes that take spectacular pictures of sunspots, solar flares, and coronal holes spewing streams of solar wind in our direction. Other GOES sensors detect solar protons swarming around our planet, raising alarms when radiation levels become dangerous.

"Our next-generation satellite will be even better," says Hill. Slated for launch in 2014, GOES-R will be able to photograph the Sun through several different X-ray and ultra-violet filters. Each filter reveals a somewhat different layer of the Sun's explosive atmosphere—a boon to forecasters. Also, advanced sensors will alert ground controllers to a variety of dangerous particles near Earth, including solar protons, heavy ions and galactic cosmic rays. "GOES-R should substantially improve our space weather forecasts," says Hill. That means friendlier skies on your future trips to Tokyo.

For the latest space weather report, visit the website of the Space Weather Prediction Center at http://www.sec.noaa.gov/ . For more about the GOES-R series spacecraft, see http://goespoes.gsfc.nasa.gov/goes/spacecraft/r_spacecraft.html . For help in explaining geostationary orbits to kids—or anyone else—visit The Space Place at http://spaceplace.nasa.gov/en/kids/goes/goes_poes_orbits.shtml .

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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Ulysses (European solar polar mission) in November began its 3rd passage over the poles of the Sun since launch in 1990. Passage over the south pole occurs over the next few months, and over the north pole at the end of 2007. The original mission was for one orbit over the poles, but Ulysses is still in great shape and returning new science data. The 1st pass was during a solar minimum (few sunspots), the 2nd near solar maximum, and now we are near minimum again. Many differences in the heliosphere were found between the first 2 passes, and it is expected the 3rd pass will find it more like the 1st, but with the magnetic field of the Sun reversed. This reversal may affect cosmic rays.

Mars Global Surveyor (MGS) lost contact with Earth. It is believed that a failure in a solar array allowed the batteries to run down. According to the last telemetry received, the problem was in rotating the solar array whose support arm cracked during launch just over 10 years ago. The original mission was scheduled to last about 2 years, but had been extended many times to continue the great observations it was making. This is the longest any spacecraft has ever lasted at Mars, and it returned more data than all previous Mars missions combined. The data will produce great science for years to come. Among the accomplishments of MGS are: pioneered the use of aerobraking into observation orbit, rather than using expensive rockets; acted as radio relay for rovers; evaluated landing sites for rovers and future landers; found gullies apparently cut by running water that are geologically young; found hematite concentrations, which are usually produced by water; produced an unprecedented global map of ground elevation; found remnants of magnetic fields, indicating that Mars once had a global magnetic field; found fan-shaped areas that are evidence of an ancient river delta where water flowed over long periods; tracked changes through several Mars years, suggesting a climate change affecting the polar caps; returned almost 1/4 million images.

Before its loss, **MGS** returned pictures of hundreds of gullies that it had previously imaged back in 1999. A careful comparison showed a number of changes had occurred. 2 gullies showed new deposits of light material that almost certainly were made by flowing liquid water. The material flowed around obstacles and branched in delta-like shapes when it reached the bottom of the slope, characteristic of water flows. The atmosphere of Mars is so thin and cold that liquid water cannot persist long on the surface. The 2 new flows ran several hundred yards, which is probably as long as the water lasted until it evaporated or froze. The new images are the best evidence yet that liquid water still flows occasionally on the surface of Mars. The water probably broke out from an underground source and carried debris downslope. The question arises whether there is an aquifer below ground that could support microscopic life. The light color could be from either frost or a salty crust. In resurveying areas for this study, 20 new impact craters were found that were not present in the previous images. They ranged from 7 to 480 feet in diameter. The ages of surfaces on Mars (and other bodies) are found by counting the impact craters of various sizes. There is some disagreement on the exact rate of new impacts on Mars, and this new data should help pin down this precisely. This should result in accurate ages being determined for landslides, water flow features, lava flows, larger craters and virtually any other surfaces. These new craters could turn out to be one of the most significant discoveries of our exploration of Mars.

Mars Reconnaissance Orbiter (MRO) has imaged both rovers and the Viking landers (which arrived in 1976). All had been imaged by MGS, but its lower resolution than MRO barely was sufficient to do this. In addition to the landers, MRO found the protective shells, and in some cases the parachutes, discarded during the landing process of all these spacecraft. In fact, the MGS image thought to be the Viking 2 lander was found from the MRO images to actually be the protective back shell. Knowing what the ground looks like in great detail at these 4 sites will help in evaluating MRO images that will be taken to find suitable landing spots for the Phoenix and other future Mars missions.

MRO is imaging in visible light and radio (radar) the south polar cap of Mars. The radar has penetrated completely through the cap and is distinguishing fine-scale layering that will yield information about recent climate cycles on the planet. Other MRO images show as-yet unexplained pitting in the layered terrain near the north pole. MRO's spectrometer is being used to seek the source of the mineral gypsum in dunes near the north pole and clay minerals elsewhere. Gypsum and clay are indicators of formerly wet conditions.

Mars rover Spirit has begun roving again, after parking during the Martian winter tilted toward the Sun to keep from running down its batteries due to low light levels on the solar panels. Rover **Opportunity** is navigating the scalloped rim of Victoria crater, stopping at promontories along the way to look at cliff walls of adjacent promontories. The top layers appear to be rocky rubble thrown outward by the impact that dug the crater. There is an abrupt transition below this to layers that are still in place from before the impact. Patterns found in the intact layers are the clearest evidence the rover has seen of ancient sand dunes.

Swift (gamma-ray burst observatory) happened to spot a burst of X-rays that turned out to be caused by a very powerful flare on a nearby star (11 Pegasi, 135 light-years away). It was about a 100 million times more energetic than a typical flare on our Sun, and would have caused climate change and mass extinction on Earth if the flare had occurred on our Sun. It spewed radiation from radio waves to X-rays. This is the first time that hard (high frequency) X-rays have been seen from a flare on any star other than the Sun. The star is a double, with 2 closely orbiting members, and tidal forces between them cause them to rotate fast (once a week compared to our Sun's once a month). Fast rotation is known to produce massive flares.

Swift also discovered a supernova in galaxy NGC 1316. The thing that makes this unusual is that the last supernova in this galaxy (discovered June) has not yet faded from sight. This is the 4th supernova in this galaxy in 26 years, far more than the average of 3 per century for large galaxies. It is known that galaxy mergers (this galaxy suffered one recently) cause rashes of hot stars to form, which then become type II supernovas, but all 4 in this galaxy have been type Ia supernovas. So the reason for so many occurring there is not understood.

Integral (European gamma-ray spacecraft) has discovered an outburst of gamma rays that has lasted for months, far longer than the phenomenon known as a gamma-ray burst. The rise and fall in brightness matched that of a black hole swallowing its companion star. Several satellites and ground-based telescopes have followed up with observations, since this type of event is fairly rare, happening only once every few years.

GALEX (ultraviolet space telescope) has caught the giant black hole in the center of a galaxy in the act of swallowing a star that came too close. This is the first time this process has been seen entirely. As it proceeded over many months, observations were made by many other space and ground-based telescopes. The black hole has the mass of tens of millions of Suns, and lies about 4 billion light-years away.

Chandra (X-ray space telescope) has studied the supernova remnant Cassiopeia A and for the first time mapped the acceleration of cosmic ray electrons in such a remnant. Cosmic rays are particles (electrons, protons, etc.) that have been accelerated to extremely high energies. Exactly how they attain such high energies has long been a mystery. The Chandra images show that the electrons are being accelerated by the tangle of magnetic fields at the shock waves in the remnant, which agrees with one of the theories of cosmic ray production.

HESS (gamma-ray telescope in Namibia) has discovered the first periodic very high energy gamma rays from space. The signal comes from a binary star composed of a massive blue star orbiting an unknown object that is possibly a black hole. They orbit in only 4 Earth days, since they are quite close (several times closer than Earth is to the Sun). The gamma rays are apparently produced when the possible black hole dives through strong stellar winds from its companion. The periodic pattern is complex because of the eccentricity of their orbit, annihilation of some of the gamma rays by light from the companion star, magnetic fields involved, and the orientation of the orbit with respect to our line of sight, which produces eclipses.

COSMIC, a constellation of 6 spacecraft orbiting Earth since April, is observing by radio the GPS satellites as they rise or set, using the radio signal as a probe of the atmosphere that the radio signals pass through. Precise measurements (to a few trillionths of a second) allow calculation of air density, temperature, moisture, refractivity, pressure and electron density. These are measured for all heights in the atmosphere each time a GPS spacecraft rises or sets. When COSMIC is fully operational, it will be providing about 2500 of these soundings a day. These are each about as useful for weather prediction as a weather balloon. Thus COSMIC will be providing more weather data than all weather balloons launched worldwide (roughly 1000 a day).

Brightest lensed galaxy – Scientists using data from the Sloan Digital Sky Survey (SDSS) has discovered the brightest known image of a galaxy so far that we are seeing it as it appeared not long after the Big Bang. Its brightness is due both to star formation and another galaxy that happens to sit in front of it and cause the light from the distant galaxy to be gravitationally lensed. Computer analysis shows that this image is brightened by a factor of 10 by the lensing. The brightness should make this the easiest to observe of all galaxies from the early Universe. The discovery was made accidentally while searching SDSS data for merging pairs of galaxies. Light from the distant galaxy took 11.2 billion years to reach us.

Massive star – The brightest star in an open cluster within the nebula NGC 6357 has long been a problem. Its mass appears to be 200-300 times that of our Sun, but star formation theory has no way to make a star over about 150 Sun masses. No other known star in our galaxy is this massive. Ground-based spectroscopic observations some time ago showed that the star is actually a double star, making each part's mass almost believable. HST observed the star recently and determined that it is actually a triple star, with the largest components about 100 Sun masses. Problem solved.

Supernova shape – A study of 17 Type Ia supernovas using the Very Large Telescope in Chile and the Struve Telescope in Texas was made to determine the shape of supernova explosions. The supernovas are too distant to resolve the shape, so the polarization of the light was observed, since the polarization depends on shape. The conclusion was that the explosion is a 2-stage process, with the first stage being a slow-burn process that throws material out asymmetrically with clumps, while the second occurs quickly and produces quite smooth debris. The supernovas were found to vary in brightness according to how smooth the debris was after the 2 stages. This is bad news and good news for astronomers who have been using Type Ia supernovas as "standard candles" to calculate distances to galaxies. The bad news is that the brightness is not uniform, and the good news is that by measuring the polarization the true brightness might be determined.

Lunar activity – Evidence has been found for recent geological activity in an area called Ina. It is a D-shaped feature over a mile wide with spots lighter than surrounding soil. Lighter areas have been exposed to space weathering for shorter geological times. Space weathering, caused by cosmic rays, solar radiation and meteoroids, darkens soil and rocks over millions of years. A new scientific paper explains the feature as being caused by outgassing that churns up the surface and exposes unweathered material. The authors do not believe this is gas from recent volcanic activity, as the Moon seems too dead for this. More likely it is gas trapped long ago beneath the surface and released by a moonquake. Scientists plan to monitor Ina and 4 similar features for possible changes caused by further outgassing.

Lunar meteoroid impacts – A team of astronomers has been watching the dark part of the Moon with two 14-inch telescopes, looking for the flashes made when meteoroids strike the Moon. A meteoroid of only 2 or 3 inches causes a flash as bright as the recent impact of the 700 pound SMART-1 spacecraft, due to the much greater speed of meteoroids. About a dozen impacts have been seen in a year of observation. This is 4 times the rate of impacts that had been calculated from meteor counts and

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was back in service. That has now been moved to a temporary location, as the structure it was attached to was taken down as part of the roof project (the steel in that structure is providing some of the structural steel we need for the roof supports, which is saving us money – structural steel is pretty expensive these days). The access point is still functioning, but the coverage isn't as good as when it was on the antenna structure, so don't be too discouraged if you can't pick it up. It'll ultimately be relocated to a new mast at the northern end of the observatory, but probably not until the roof work is done.

Meanwhile, we've also seen some great developments with the Kuhn itself, which I don't have room to go into here. Suffice it to say that whenever you're next at Anza and the Kuhn is in operation, you should really check out the view – thanks to a lot of work by Pat Knoll, with help from Joe Busch and Karl Stahl, we've finally got good collimation, the main mirror is clean, some other problems have been taken care of, and the view through the Kuhn on a good night is breathtaking! More improvements are in store, so stay tuned for further updates!

Some Final Thoughts…

2007 is getting off to a great start – and it just happens to be the club's 40th anniversary. This is great cause for celebration, and if you have any ideas on we should do or would like to help in organizing any special activities to commemorate this, please let me know.

And please show how much you care about the club and its future by sending in your ballot early! ■

FOR SALE: Achromat Triplet Objective in thick lens cell, 1602mm Focal Length, 188mm Diameter (f/8.5). Weighs 10lbs. It comes with a certificate. Asking price $600.00. Contact Vittal at badithenv@sbcglobal.net.

FOR SALE: Meade 5" f9.3 refractor with a Celestron CG-5 computerized mount. Includes: polar finderscope, 2" dielectric diagonal; 2" 26mm wide angle eyepiece; 8X50 finder, all rings and mounting hardware with counterweights and case; MV-20 11/4" filter; Cheshire eyepiece and soft case for tube assembly included. All in excellent condition. Contact Val Akins (949) 855-9018 Asking price; $775

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OR contact homeowner /astronomer Gary Emerson < gemerson@att.net > for more information.

(continued from page 7)

brightnesses observed on Earth. Observations of the Moon will continue to see if there really are lots more meteoroid impacts than we thought. This will be particularly important to understand before people go to the Moon for long stays.

Asteroids and dinosaurs – Yet another study of the geological layer from the time of the mass extinction that included the dinosaurs has concluded that there is only one layer from an impact, and that it coincides with the mass extinction. The samples of the layer were taken from a rise in the bottom of the Atlantic Ocean, and were thought to be relatively undisturbed. The conclusions contradict other recent studies that have concluded there were at least 2 impacts, and that the extinction was later than the impact in the Yucatan area. This controversy will likely continue awhile.

Space shuttle Discovery launched December 9 on one of the most complex missions ever to continue building the International Space Station. The 12-day mission delivered a new truss to extend the backbone of the station. The complexity though lies in switching over from the interim to the permanent power system and cooling system. This is done by turning off half the station at a time and reconnecting much wiring and electrical devices. You just don't turn off the entire electrical system when your life support systems need to keep powered up. Also Discovery delivered astronaut Sunita Williams to replace Thomas Reiter, who completed his 6 months aboard the station.

EELT – The governing body of the European Southern Observatory has budgeted 57 million euros ($76 million) to proceed with detailed studies for the European Extremely Large Telescope (EELT). It will be an optical and infrared telescope with a 42 meter diameter, more than 4 times that of the largest telescopes now (the Keck Telescopes). The main mirror will be composed of 906 hexagonal segments. The secondary mirror will be 6 meters, larger than the Palomar main mirror. Studies are scheduled to end in 3 years, and completion of the telescope in 2017. It will have 2 flexible mirrors, one with over 5000 actuators, to implement adaptive optics to correct the distortions of the atmosphere. The site will not be decided until 2008. It will probably cost over a billion dollars.

GRACE (twin gravity spacecraft) have been collecting extremely precise data of the Earth's gravity for about 5 years now. Scientists are finding that most of the changes season-to-season and year-to-year are the result of movement of fresh water. Quantities of water stored in rivers, lakes, reservoirs, floodplains, snow, ice, in soil and aquifers are easily measured. River basins in Africa were found to be drying over this 5-year period, while the Mississippi and Colorado basins are increasing stored water. Before GRACE it was difficult to determine amounts of underground water by any means; now it is easy. The GRACE data is proving quite valuable in understanding climate changes and for water management.

Instant AstroSpace Updates

The **Arecibo** radio telescope has obtained the most detailed ever radar images of a binary near-Earth asteroid, 1999 KW4, showing one component is spinning as fast as possible without breaking apart, and the other is wobbling. It passed quite close to Earth (3 million miles) in 2001, and although it will again approach closely, accurate orbital data show there is no chance it will hit Earth in at least the next 1000 years.

The US Air Force (not NASA) is developing the **X-37B**, a space vehicle that resembles a small space shuttle, but is unmanned and is launched atop an Atlas rocket. It will be used, starting in 2008, to test advanced technology for space that needs to be returned from orbit after test.

New Horizons (Pluto mission) has observed Pluto for the first time, but just as a dot, during a test of the optical navigation system. It will be 2015 before views of Pluto will exceed those taken from Earth.

Rosetta (European comet mission) will swing by Mars in early February to get a gravity assist towards its eventual target comet Churyumov-Gerasimenko in 2014, after 2 more gravity assists and an asteroid flyby. Mars will be studied during its flyby to test of the spacecraft.

The **Cryogenic Dark Matter Search II** is a set of particle detectors cooled to nearly absolute zero, located deep in a mine in Minnesota. Its purpose is to detect theoretically predicted WIMPs (Weakly Interacting Massive Particles) that may make up most of the dark matter of the Universe. No results yet, but not all detectors have been completed.

The Subaru Telescope in Hawaii became the 4th large telescope in the world with a **laser guided adaptive optics** system. A test achieved 0.06 arc second resolution, 10 times better than typical seeing without the system.

International Dark-Sky Association E-News Update
courtesy of Charlie Oostdyk

November 30th, 2006

Meetings

The International Dark-Sky Association invites your participation in our 19th Annual General Meeting (AGM), March 4-6, 2007; at the Doubletree Hotel at Reid Park in Tucson, AZ. This year we present *Energy Savings, Sustainability, and Urban Planning* as our theme, with speakers from energy efficient lighting manufacturers to sustainable design planners. We are also very excited to announce special social activities for the duration of our conference. These include a guided tour to Kitt Peak National Observatory on Sunday, March 4th; a star party at the Doubletree Hotel on Monday; March 5th, and of course, the annual Awards Banquet on Tuesday, March 6.

This conference will be held in conjunction with the International Commission on Illumination's USA Board Meeting (CIE-USA), March 7, and the Illuminating Engineering Society of North America's Roadway Lighting Committee meeting (IESNA-RLC), March 8-10.

For more information on IDA's 19th Annual General Meeting, please visit www.darksky.org.

Also, don't forget *The Night: Why Dark Hours Are So Important*, a two-day, multi-disciplinary symposium at the Carnegie Institution of Washington, DC. *The Night* will focus on the nighttime environment and its wide-ranging connection to such disciplines as astronomy, biology, ecology, energy, engineering, government, human health, outdoor lighting, and urban planning. By including top researchers, educators, innovators, and executives, this conference will highlight the importance and necessity of bridging disciplines in order to preserve society's heritage of dark skies and present a quality nighttime environment.

This symposium is free and open to the public; however, entrance to the auditorium requires an event name badge. For more information and in order to register, please visit www.nightsymposium.org.

You may also contact kim@darksky.org or call 520-293-3198 for more information.

Call for Lighting Awards Nominations

Nominations are being accepted for the 2007 IDA Lighting Design Award, Hoag/Robinson Award, Executive Director Special Award, and George and Edythe Taylor Student Award. Winners will be announced during the 19th Annual General Meeting at the Doubletree Hotel at Reid Park, March 4-6, 2007. Visit the IDA awards page for information on each award and the nominating process at http://www.darksky.org/programs/awards.php. Nomination deadline is February 15, 2007. For more information on the meeting, visit www.darksky.org.

Starry Nights Festival 2006

Matthew Ota

The 10th annual Starry Nights Festival was held in the recreation center of the city of Yucca Valley on Saturday, October 14. A star party was held at Machris Park the previous night.

At noon, the lectures began with a talk by Dennis Mammana about observing in the desert skies. I arrived late and did not get to see all of his presentation. However, at the end he had an entertaining astronomy PowerPoint slide show set to music.

Next was David Arvidson's presentation on distance measurements in the universe. He started with Eratosthenes' use of gnomons at Alexandria and Syene in Egypt and ended with modern methods such as the Hipparcos astrometry mission. He had a tremendous amount of material to cover and was not able to elaborate on many of the topics, which could have filled and entire afternoon. He did give due credit to Henrietta Leavitt's Cepheid variable star work at the Harvard Observatory and Vesto Slipher's pioneering measurements of red shifts inside of galaxies from the Lowell Observatory.

Alex McConahay of the Riverside Astronomical Society gave a travelogue about the Riverside Astronomical Society's solar eclipse trip to the Middle East. This group of intrepid travelers viewed the eclipse from Egypt, and Alex gave an entertaining account of their adventures there. It not only covered the eclipse, but also Egyptian culture.

The planetary geologist Gary Peterson was next. He gave a compelling presentation on astrobiology from the perspective of a geologist. He made some interesting observations. One was that the planets are just collections of asteroids. When they formed they collected asteriodal material as they swept around in their primordial orbits accreting into larger planets. He further asserted that a good portion of the water on Earth came from comets, and explained how each planets mass and gravity had a large influence on which gasses were retained. He explained how the Earth's atmosphere and even geology has been changed over time by the presence of life,

By comparing geologic processes on Earth and on Mars, he was able to predict which kinds of minerals should be found on Mars that would support the theory of early life there. He mentioned the hematite found on Mars by the rovers, and the fact that hematite forms only in an oxygen laden atmosphere. Since oxygen is such a reactive element, its presence as a free molecule in a planet's atmosphere is almost a sure guarantee of biological activity.

Mars had a very different atmosphere in its past, compared to its present day residual carbon dioxide atmosphere. The proof of a denser atmosphere in the past comes from the large numbers of water-cut channels that are seen in images returned from orbiters, and the clays that have been detected with other instruments

He mentioned other minerals such as carbon that could be present at the surface that would support the idea of early life on Mars, but it would take a more sophisticated rover spacecraft like the upcoming Mars Science Lab to find it. Mars has such an interesting history and there is an ongoing program of discovery that will continue as we press toward eventual manned missions there.

At 4:00 there was a break in the lectures for the raffle drawings. Sam Davidson ran the show, and had a great time giving out the prizes - which ranged from a custom knit astro afghan to a 6 inch Discovery dobsonian telescope.

David Levy was the keynote speaker, and this year he had an interesting account on his recent comet discovery. He definitely lives an unconventional life in Arizona, rising before sunrise almost every day to sweep parts of the sky that are not covered by automated telescope surveys. His discovery happened as he was looking at Saturn with his 16 inch telescope "Miranda". He noticed a faint "ghost image" near the planet. He thought it may be an optical phenomenon as it was only 6 tenths of a degree from Saturn, so he switched over to viewing through his commercial GPS SCT telescope. The smudge was still there, so he checked all of the existing comet data on his computer, verifying that it was a new one. He then reported the comet to the Central Bureau of Astronomical Telegrams, after getting accurate position data by using the GPS telescope. As this was Yom Kippur morning, he went to temple and when he returned, CBAT had confirmed his discovery. It was his eighteenth visual discovery of a comet, and it came after twelve long years of patient searching. His patience and tenacity really had paid off.

The City of Yucca Valley had installed a free wifi transmitter, so I was able to go online during the proceedings and to display and monitor a live satellite weather image centered over Yucca Valley. There was a low pressure system rotating right over the city, bringing clouds and even some rain in the afternoon. So for the first time in ten years of festivals, the star party at Machris Park was cancelled. Ironically the following morning brought crystal clear skies.

The attendance level was larger than last year, even though the weather was bad. The caliber of the speakers alone made it worth the trip, and the city of Yucca Valley did a great job accommodating the attendees…as extra chairs had to be brought in for the overflow of people.

Amateur astronomy is not just taking your telescope out for viewing the night sky. There is just as much enjoyment listening to well informed speakers. It is great brain food that helps you to appreciate what you can see with your own telescope, or with your own astroimaging equipment. The amateur astronomy community is alive, vibrant and growing with our neighbors in the high desert of Southern California.

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The Newsletter of the Orange County Astronomers

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CLUB OFFICERS			
President	Barbara Toy	btoy@cox.net	714-606-1825
Vice-President	Craig Bobchin	ETX_Astro_Boy@sbcglobal.net	714-721-3273
Treasurer	Charlie Oostdyk	charlie@cccd.edu	714-751-5381
Secretary	Bob Buchheim	rbuchheim@earthlink.net	949-459-7622
Trustee	Gary Schones	gary378@pacbell.net	714-556-8729
Trustee	Tom Kucharski	TomRigel@aol.com	949-348-0230
Trustee	Matthew Ota	matthewota@yahoo.com	800-731-6012 ext. 21
Trustee	Steve Short	steves@inductor.com	714-771-2624
Trustee	Alan Smallbone	asmallbone@earthlink.net	818-237-6293
Trustee	Leon Aslan	leon@socalastro.com	562-305-6455
Trustee	Steve Condrey	SiriusAstronomer@OCAstronomers.org	951-471-0153
COMMITTEES, SUBGROUPS, AND OTHER CLUB VOLUNTEERS			
Press Contact	Russell Sipe	russell@sipe.com	714-281-0651
Sirius Astronomer Editor	Steve Condrey	SiriusAstronomer@OCAstronomers.org	951-471-0153
Website Editor	Hassi Norlen	hassi@norlens.net	714-710-9444
Website Coordinator	Rob Carr	RCCarr@excite.com	909-606-1241
Beginner's Astronomy Class	David Pearson	astrodwp@dslextreme.com	949-492-5342
Observatory Custodian/Trainer/ Member Liaison/Dark Sky SIG	Barbara Toy	btoy@cox.net	714-606-1825
Astrophysics SIG	Chris Buchen	buchen@cox.net	949-854-3089
AstroImagers SIG	Bill Patterson	bill@laastro.com	714-578-2419
GoTo SIG	Mike Bertin	MCB1@aol.com	949-786-9450
EOA Liaison	Del Christiansen	DelmarChris@earthlink.net	714-895-2215
Anza Site Maintenance	Don Lynn	donald.lynn@alumni.usc.edu	714-775-7238
Librarian	Karen Schnabel	karen@schnabel.net	949-887-9517
Membership, Pad Coordinator	Charlie Oostdyk	charlie@cccd.edu	714-751-5381
Explore the Stars OCA Contact	Richard Cranston	rcransto@ix.netcom.com	714-893-8659
Black Star Canyon Star Parties	Steve Short	steves@inductor.com	714-771-2624
OCA Outreach Coordinator	Jim Benet	jimbenet@pacbell.net	714-693-1639
Telescope Loaner Program	Mike Myers	loanerscopes@twow.com	714-240-8458
Anza House Coordinators	Steve and Sandy Condrey	AnzaHouseIssues@yahoo.com	951-471-0153
WAA Representative	Tim Hogle	TimHogle@aol.com	626-357-7770

OCA Website: http://www.ocastronomers.org **STARLINE 24-hr recording: 714-751-6867** **ANZA OBSERVATORY: 951-763-5152**