SIRIUS ASTRONOMER

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The Newsletter of the Orange County Astronomers

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REMINDER: SEPTEMBER MEETING MOVED TO SEPTEMBER 5TH!

Don Lynn captured this image of NGC 6193 (cluster) and NGC 6188 (nebula) via an Internet-linked telescope in Australia on June 5, 2008. For those of us presently unable to afford a lengthy stay Down Under, Internet observing is a handy way to clear out one's Southern Hemisphere list!

OCA CLUB MEETING

The free and open club meeting will be held Friday, September 5th at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. The main speaker is yet to be announced as of press time, so be 65sure to check the website for updates.

NEXT MEETING: October 10th

STAR PARTIES

The Black Star Canyon site will be open on September 20th. The Anza site will be open on September 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, September 5th at the Centennial Heritage Museum at 3101 West Harvard Street in Santa Ana.

GOTO SIG: TBA (contact coordinator for details)

Astro-Imagers SIG: Sep. 16th, Oct. 21st

EOA SIG: Sep. 24th, Oct. 22nd

Astrophysics SIG:Sep. 19th, Oct. 17th

Dark Sky Group: TBA (contact coordinator for details)

President's Message

By Barbara Toy

My apologies – I'm afraid I fell down a bit on the job last month, as I didn't realize until after the August issue of the Sirius Astronomer went to press that I had forgotten to give notice of the fact that our September general meeting had been moved to the first Friday of the month instead of our usual second Friday, because Chapman University needs to use the Chapman Auditorium for another function on our usual night. In case you see this before the first Friday of September – unlikely, but miracles sometimes happen – please remember to come to the meeting on the first Friday of the month, September 5th, instead of the usual second Friday of the month. We will resume our usual schedule in October...

The end of August and beginning of September mark the end of summer vacation and beginning of the new school year for many people. September also marks the beginning of the next new cycle of the Beginners Class, which runs for six sessions, one each month (September through February, then March through August). September is the month of the autumnal equinox, and also the Harvest Moon, which (or so I'm told) was important in agricultural societies because it gave enough light that the harvest could continue through the night hours. However good it might be for farmers, and even though the Harvest Moon can be a very pretty sight as it rises opposite the setting sun, the full moon is generally not a real favorite of most astronomers, particularly those of us who enjoy the dimmer fuzzies of the night sky – if you're thinking of viewing that night, I doubt you'll see much of anything dimmer than Jupiter.

Although it can get chilly in September, usually viewing temperatures are still very comfortable at night, and the winter constellations are rising well before dawn, so you actually have a chance to see them in reasonable comfort compared to the winter months, though, of course, much later in the night than in winter. It's worth a late night to see Orion without need of a heavy jacket and gloves – at least once!

The First Annual Pacific Astronomy and Telescope Show (PATS) Is Almost Here...

People who are familiar with NEAF on the East Coast have frequently commented that we need a similar large astronomical conference on the West Coast, where people can have access to all kinds of vendors and be entertained and educated by a variety of speakers and other activities. It's a lot easier to spot the need than to pull something like this together, but the folks that have been bringing us RTMC for many years decided this last year to undertake this challenge.

As a result of their efforts, the very first PATS conference will take place at the Pasadena Convention Center on September 13th and 14th, starting at 9:00 a.m. each day. Why should you as a member of the local astronomical community go to this event? There are a lot of reasons, ranging from enlightened self-interest to a desire to support the fine folks that put so much time and energy into bringing us a truly wonderful event. And, while it may be a bit small-minded to think of it this way, as true Californians, do we want to give people on the East Coast reason to think that they can put on an event that that we can't duplicate or improve upon?

For those who may be moved by enlightened self-interest, both days feature a series of speakers that include Terry Mann (President of the Astronomical League) on "What's Out There," Astronaut Story Musgrave on the Hubble repair mission, a panel of astronomers from Cal Tech on frontiers of astronomy, Brian D. Warner and Jerry Foote (Society of Astronomical Sciences) on doing science with your telescope, Gary Palmer on "the Sun in motion," Robert Naeve on "Behind the Scenes at Sky & Telescope," John Dobson and David Levy. Truly a varied set of speakers and topics!

Another reason to go as a matter of enlightened self-interest is that 70 astronomy-related vendors and organizations have already committed to being there – a wider variety of vendors than you'll find at RTMC, as there are a lot who don't want to deal with the dust and other damaging conditions out there. This is your chance to see a more kinds of imaging equipment, software, and astronomical goodies than you could find in any other single location in Southern California – and, if this goes well, there should be even more next year! So, come out and support this great new addition to the local astronomical scene! And do plan to stop by the OCA booth while you're there!

Dennis Mamana Class

If you came to our July General meeting, you may recall the many beautiful photographs that Dennis Mamana, our main speaker for that meeting, showed in the course of his talk on night sky photography (which he carefully distinguished from astroimaging, defined as imaging using a telescope instead of just a camera on a tripod). If you weren't there – well, you missed a very good talk.

Dennis teaches classes in night sky photography, and takes genuine pleasure in seeing what other people are able to do with his techniques. After the July meeting, I exchanged several e-mails with him about setting up a class specifically for OCA members, as I'd heard from a number of people who were interested in taking one of his courses. The upshot was that he scheduled a special class for us, which took place in Borrego Springs on August 9, and turned out to be longer and filled with a broader range of information than I'd expected.

Dennis's style of night sky photography aims to get pictures close to what people can see with their own eyes, without magnification, though there are some differences as a camera gathers more light than the human eye. He particularly enjoys taking naked-eye objects in the night sky with interesting foreground objects that are part of the terrestrial landscape, such as rock formations or trees. Anything that can provide an interesting foreground or frame to the celestial object of interest is fair game, whether they are generally considered "natural objects" or not, so buildings, cars and people can be interesting additions. The point is to have an interesting picture that includes the celestial target(s) as part of the composition.

The class was only $55 per person, and we started shortly after noon. Since our group ranged from beginners to experienced photographers, he covered a lot of photographic basics as well as areas more directly related to taking these types of photographs, such as composition and when the best lighting conditions occur for this type of photography. Although we were generally a quieter group than many he's taught, his enthusiasm never waned, nor did his desire to be sure that we really did understand what we needed to know in order to get some good images.

After an entertaining dinner at the local watering hole (which had excellent food, though I can personally attest only to the Mushroom Swiss Burger), we headed out to the desert to take the pictures. Specifically, we headed to a canyon area outside of Borrego Springs, and we got there before sunset, so we could get pictures in the sunset light as well as through the various stages of twilight.

It was great fun wandering around the canyon, trying to set up interesting shots that included identifiable celestial objects and an interesting foreground, lit by a slightly gibbous moon (Dennis told me that he likes to take pictures when the moon is a little bigger than a quarter, but when it's more than a couple days past first quarter it's too bright for good star pictures). I had some success framing the moon through one of the bushes on the floor of the canyon (that picture may appear somewhere in this issue), but another shot that seemed like a really good concept – Delphinus above some rocky undulations that kind of looked like waves from where I was originally standing – didn't work out as well as I'd hoped. The ISS came through on an orbit that took it very close to Jupiter early in the evening, and I think everyone was shooting away at that but I haven't seen many results – mine came out as a sequence of three pictures with a bright spot that visibly moved from shot to shot, but otherwise looked pretty much like the bright spot that was Jupiter in each of the shots. Alan took longer exposures and so got the ISS as a streak, which was a lot more interesting.

While we were all pretty much doing our own thing with our cameras, Dennis was helping those who were having problems with their equipment and giving helpful suggestions to all of us when appropriate, so he was kept pretty busy. We finally started

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AstroSpace Update

September 2008
Gathered by Don Lynn from NASA and other sources

Phoenix (Mars lander) successfully rasped hard frozen soil from a couple of inches below the surface and dumped it into an analyzer oven. Unfortunately most of the soil stuck to the scoop rather than entering the analyzer. The scoop was shaken and the oven was vibrated, but still not enough material entered. Last time the ovens were vibrated, a short circuit occurred, but this time no electrical problems occurred. After about 2 days, sufficient soil was finally coaxed into the oven by further vibration, and water (from ice) was found in the sample. As was learned with the first sample analyzed a few weeks ago, delay of a few days allows the ice in the sample to evaporate (sublime) before the analysis. This time, the sample entered the oven about a day more quickly, and some water still remained when the oven closed its door and began analysis.

The electrochemistry analyzer on Phoenix found in a soil sample **perchlorate**, an ion composed of chlorine and oxygen, which was not expected. A similar sample in the analyzer oven showed oxygen, but not chlorine. Scientists continue to try to determine why the chlorine did not show up. It is possible that this form of perchlorate does not break down into chlorine. It is also possible the perchlorate was a contaminant somewhere on the spacecraft, affecting only some samples. Work is being done to eliminate the possibility it is a contaminant. Scientists were going to try to sort all this out before announcing these results, but an article in Aviation Week magazine said that Phoenix scientists were withholding data reflecting on the possibility of life on Mars, so the scientists released the results so far to clear up some misconceptions from the article. Although some scientists expressed concern that perchlorate might preclude the possibility of microscopic life ever having evolved on Mars, others opined some forms of life tolerate, or could even thrive, on perchlorate.

Phoenix also took a series of images to try to spot dust devils, such as have been seen by the Rovers. A laser beam is being used to study the clouds and dust above the lander. Recent images of the white material uncovered by the blast of the spacecraft's landing rocket show that cracks have formed in it, the texture has roughened, and some other changes occurred. This supports the belief that it is composed of water ice. NASA approved an extension of the Phoenix mission for 5 weeks beyond the originally planned 90 days. The first image from the atomic force microscope shows a dust particle about 1/25,000 inch across, agreeing with predictions made of the size of airborne dust to explain the colors of sunsets on Mars.

Like a student facing final exams, **Phoenix** pulled an all-nighter. It stayed up all night (it normally is commanded into sleep mode to conserve battery power at night) studying the weather and changes to the surface, coordinating with Mars Reconnaissance Orbiter, which was studying the same areas at the same time. Not that there really is a night, since Phoenix landed above Mars' arctic circle and it is summer, so the Sun doesn't ever go down. Phoenix took images of the Sun at various times and they were stacked together to show how the Sun dips down toward the northern horizon, doesn't quite reach it, then rises again for the morning. The wrap-around panorama color image of Phoenix's surroundings has been assembled and released.

Martian water – 2 studies based on data from the Mars Reconnaissance Orbiter have confirmed previous evidence that the Red Planet once had vast lakes, flowing rivers and a variety of other wet environments. The first study showed that huge regions of the ancient highlands of Mars contain clay minerals that can form only in the presence of water. Volcanic lava buried the clay-rich regions during subsequent drier periods, but impact craters later exposed them at thousands of locations. The big surprise from these new results is how pervasive and long-lasting the wet environments were. The clay-like minerals date back to the Noachian period, approximately 4.6 to 3.8 billion years ago, before the lava flows that overrode them. The wet period may have been suitable for primitive life to have developed. The 2nd study found that wet conditions on Mars persisted for a long time. Thousands to millions of years after the clays formed, fiver channels eroded them out of the highlands into a delta where the river emptied into a crater lake slightly larger than Lake Tahoe. Standing water must have persisted for thousands of years for this delta to form. Clays are great for trapping organic matter, so this would be a great place to look for evidence of past life on Mars.

Cassini (Saturn mission) has taken infrared spectra of one of the dark areas on Titan thought to be lakes of liquid hydrocarbons and has positively identified ethane. This finally proves that some of the hundreds of dark areas are indeed lakes. Titan's atmosphere was already known to contain ethane, methane, and other hydrocarbons, though it is mostly (95%) nitrogen. The lake observed is named Ontario Lacus, after the Earth's Lake Ontario, which is about the same size. The ethane in this lake is in solution with methane, other hydrocarbons and nitrogen. The observations showed the lake is surrounded by a dark beach, suggesting that the liquid is evaporating, lowering the surface of the lake.

Cassini flew a mere 30 miles above the moon **Enceladus** to get high-resolution images (as good as 23 feet per pixel) and temperature measurements of the areas where geysers are spewing from the surface. Measurements of geyser particle size and composition were also made. 2 more close encounters with Enceladus are scheduled for October. The flyby was at 40,000 mph, which normally would have smeared any images, but a technique was developed in which the spacecraft is spun up in the direction of motion, before the flyby, then images are taken in rapid succession with the spin compensating for the relative motion of the Moon. It worked wonderfully and very clear images were obtained. The "Tiger Stripes" appear as fractures about 1000 feet deep, with V-shaped inner walls. The outer flanks of some of the fractures show extensive deposits of fine material. Surrounding the fractures is finely fractured terrain littered with blocks of ice tens of yards across and larger. Over geologic time, the geysers appear to have moved up and down the lengths of the fractures. Scientists hope the new observations can answer the question of whether reservoirs of liquid exist beneath the geysers, as opposed to other theories attempting to explain the material being thrown out of the fractures.

Meteorite source – For many years, astronomers have tried to match the spectra of meteorites with that of asteroids, since meteorites are believed to be asteroidal pieces that happen to hit Earth. The most common type of meteorite, chondrite, has resisted such identification. Theory is that the surfaces of asteroids weather with exposure to micrometeoroids and solar wind, which changes their spectra. In 2006, 4 new families of asteroids were identified that appeared to be relatively young, that is, each family consisted of the fragments from a collision that happened recently, in astronomical terms. The ages of the families ranged from 50,000 to 600,000 years. Spectra of these asteroids, relatively unweathered, matched the spectra of chondrites. This supports the belief that meteorites are asteroid chips, and that space weathering changes the spectra of asteroids.

Makemake – Another object has been identified as a dwarf planet and plutoid (dwarf planet outside Neptune's orbit). This is the 4th dwarf planet and 3rd plutoid known. It has been officially named Makemake, after the creator god of Easter Island. This was a continuation of the Easter theme, since it was discovered at Easter 2005, and had been informally known as Easterbunny by its discoverers, Mike Brown's team, who previously discovered the plutoid Eris.

COROT (planet-search orbiting telescope) has found another planet, this one about the size of Jupiter, and orbiting a Sun-like star every 9.2 Earth days. COROT finds planets when they cross in front of their star. Since most planets pass above or below their stars, the spacecraft has to monitor 50,000 stars to find just a few planets. The new discovery has the longest year (orbital period) of all transiting planets known. The star rotates with the same period as the planet's orbital period. That was unexpected, since no mechanism is known to link these periods unless a planet orbits far closer than this.

Dark energy – A team of astronomers has measured the effects that superclusters of galaxies and supervoids (regions of space about 1/2 billion light-years across with excess or deficit galaxies respectively) have on cosmic microwave background radiation passing through them, and found that it implies the existence of dark energy. Theoretically microwaves passing through a region of higher gravity (supercluster) should gain energy as they proceed towards the center, then lose the same amount of energy as they leave the region. The opposite happens in supervoids (lose energy first, then regain equally). But if the expansion of the Universe accelerates during the passage of microwaves through a supercluster, then the microwaves retain some of the gained energy (lost energy for voids). This effect has not been measured before because the ripples in the cosmic microwave background are larger than the effects of superclusters or supervoids. This team was able to overcome this by averaging the measurements over 50 superclusters and 50 supervoids.

Overlooked nova – XMM-Newton (orbiting X-ray telescope) discovered X-rays where they had not been previously, and follow-up observations showed that it was a nova in Puppis. It had exploded months before, but had gone unnoticed even though it was naked-eye visible for awhile. Review of automated survey images put the explosion date at June 5, 2007. Novas of this type occur when material from one star falls onto its white dwarf companion star until enough material accumulates to ignite.

Nova shell – For the first time, astronomers have observed the expulsion of a shell of dusty gas around a freshly erupted nova, and tracked its expansion for over 200 days. Nova Scorpii 2007a, discovered February of last year, was studied with the VLTI, a combination of 8-meter telescopes in Chile used as an interferometer, which has extremely high resolution. Comparing the observed rate of expansion to the red-shift speed of expansion (over 1 million mph) allows calculating an accurate distance to the nova, which was found to be 5500 light-years. This is the first time this technique has been used. The mass of dust ejected was found to be over 30 times the Earth's mass.

Strange supernova – More information is now available on the supernova recently seen in galaxy NGC 2770. As reported here last month, this supernova was seen earlier than any other, since it was discovered in X-rays, and X-rays are emitted before visible light. Spectral data classified it as Type Ic, the type thought to produce long-duration gamma-ray bursts. But the initial burst of X-rays was of lower energy, as would be expected from other, lower-energy, types of supernovas. The mass and energy of the supernova were too small to be a supernova that produces gamma-ray bursts. This has led some astronomers to claim that this event was a sort of weak gamma-ray burst, without quite enough mass or jet activity to be a normal burst.

Weighing galaxies – A team of astronomers has collected the largest collection of galaxies seen through gravitational lenses, 70 in all. The bending of light when it passes near a massive object, as explained by Einstein's General Relativity, causes the gravitational lensing effect. So the team took images with the Hubble Space Telescope (HST) of many objects that appeared to be lensed galaxies in the Sloan Digital Sky Survey (SDSS). The lensing effect of a massive galaxy that lies in front of a very distant galaxy makes the distant one appear much brighter than it ordinarily would, and causes bright rings or multiple images of the distant one. By using the distance measurements of the galaxies made by SDSS and the sizes of rings in the lensed images, astronomers could calculate the mass of the galaxy causing the lensing. Comparing this mass to the mass of the stars seen in the galaxy allowed determination of the amount of dark matter around the galaxy. It was found that the fraction of the total mass that is dark matter increases with the size of the galaxy. That is, larger galaxies have a larger fraction of total mass that is dark matter.

Distant galaxies – HST observed 6 massive galaxy clusters to see what showed up in the gravitationally lensed images of objects behind the clusters, and found 10 extremely distant galaxies. The magnification of the gravitational lens allowed galaxies to be seen that would normally be too dim. It is estimated that these 10 are so distant that their light took about 13 billion years to reach us, so we are seeing them as they were only 700 million years after the Big Bang. The estimate was made from the relative brightnesses of the galaxies in visible and infrared light. Unfortunately, confirmation of the distances by measuring the redshift in their spectra has not been possible because they are too dim for any current telescope to take a spectrum. This is the largest sample of very distant galaxies found to date. Much of the gas in the Universe was re-ionized (that is, the electrons were knocked off the atoms and

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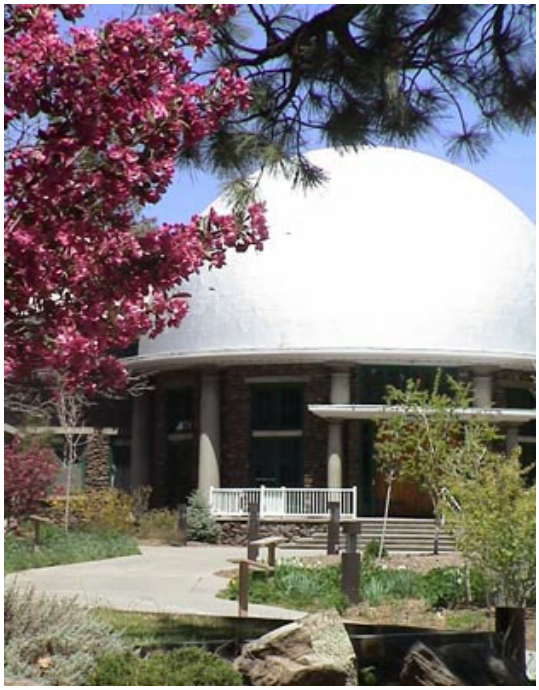
The Lowell Observatory

By William S. Sinclair



This observatory is situated on a hill a couple of miles outside of Flagstaff, Arizona. This site (dubbed Mars Hill) was chosen in 1894 by Percival Lowell, after his careful survey of many other locations. The most desirable characteristic then was the seeing conditions.

At that time, Flagstaff was a very small community of about 300 people, and there weren't any paved roads to speak of, much less automobiles. In fact, pack mules had to be used to transport the equipment up the hill.

Many of you recognize Percival Lowell as an avid planetary observer, but his primary obsession was Mars. Although Schiaparelli (in 1877) first claimed to see them, it was Lowell who popularized the romantic notion of the Martian "canals," claiming they were built by an intelligent civilization to transport water from the polar caps. In the early days of the 20th century, planetary imaging had to use rudimentary photographic plates. Because of seeing conditions and the lack of adaptive optics, photographic images were quite fuzzy. Consequently, the astronomers had to rely upon human observations. Some observers said they saw the canals, while others did not. Lowell never asserted that a living civilization was present, but speculations of that sort were rampant in the media, doing wonders for his popularity.

The early observations were made with the 24 inch Clark refracting telescope. Lowell also was searching for "Planet X," a trans-Neptunian body, which he postulated due to observed irregularities in the motions of Uranus and Neptune. He was not successful after 10 years of searching, finally dying in 1916. However, Clyde Tombaugh later discovered Pluto in 1930 using the same equipment.

The observatory's main focus was planetary work, but under Lowell's direction Vesto Slipher was directed to observe and record spiral nebulae. At the time, it was not realized that they were galaxies like our Milky Way. Slipher did pioneering work by using a brand new spectrometer to establish a red shift for the nebulae, the first direct proof of the expansion of the universe. When Lowell died, Slipher then became director of the observatory for 50 years.

The Martian canals remained a controversy until 1971. Finally, the matter was settled with JPL's Mariner 9 probe and its close-up imaging of Mars. It then became apparent that the canals were an optical illusion, perhaps brought on by excessive zeal and fatigue.

Later, as Flagstaff grew in size, light pollution became a problem. Every year the observatory staff had to petition the city to use LPS (low pressure sodium) lamps for street lighting, a shielded kind that doesn't radiate skyward. Eventually the problem got to be so serious that a new site was set up at a location 10 miles southeast of town, called Anderson Mesa. It is only there that serious observations are currently made. However, the staff personnel with their dwellings and offices still reside at Mars Hill.

After the new observing site became operational, the Mars Hill site was converted into a successful tourist location. They added guided tours and lectures, and installed interactive video games. For example, in one video game I was asked to look at a photographic image of a star background, and pick out what I thought was a Kuiper Belt object, then I was told whether I actually picked out one or an asteroid. Also available was a short TV clip showing the history of the observatory every half hour, where they also described the current serious research.

In the tour I attended, we were shown the Clark telescope, the Slipher building, other unused pieces of equipment, and Lowell's mausoleum. The Clark telescope is still used for evening tourist viewing when weather conditions permit. We were shown the inside of the dome, and allowed to manipulate the observing slit and the telescope. Although it weighs six tons, the telescope can still be easily pushed by hand, and the dome can be electrically rotated by school children. They also have a planetary walk, where signs are erected at proportional distances of the planets from the sun. The sun-pluto distance is about 300 yards.

The main focus of research is still planetary imaging, but the spectral coverage has been extended to the far infrared, and there is a concerted effort to complete an optical interferometer for the US Navy. They also have an observatory (USNO) near Flagstaff, and share the observing site with the Lowell personnel.

NASA's Space Place

A Google for Satellites: Sensor Web 2.0

If you could see every satellite passing overhead each day, it would look like a chaotic meteor shower in slow motion.

Hundreds of satellites now swarm over the Earth in a spherical shell of high technology. Many of these satellites gaze at the planet's surface, gathering torrents of scientific data using a dizzying array of advanced sensors — an extraordinary record of our dynamic planet.

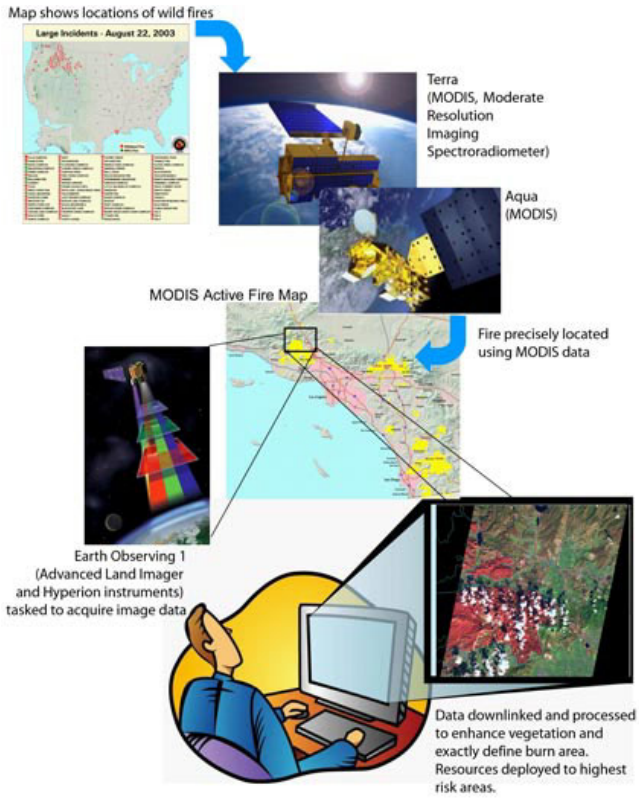
To help people tap into this resource, NASA researchers such as Daniel Mandl are developing a "Google for satellites," a web portal that would make requesting data from Earth-observing satellites almost as easy as typing a search into Google.

"You just click on it and it takes care of all the details for you across many sensors," Mandl explains.

Currently, most satellites are each controlled separately from the others, each one dauntingly complex to use. But starting with NASA's Earth Observing-1 (EO-1) satellite, part of the agency's New Millennium Program, Mandl and his team are building a prototype that stitches these satellites together into a seamless, easy-to-use network called "Sensor Web 2.0."

The vision is to simply enter a location anywhere on Earth into the website's search field along with the desired information types — wildfire maps, vegetation types, floodwater salinity, oil spill extent — and software written by the team goes to work.

"Not only will it find the best sensor, but with proper access rights, you could actually trigger a satellite to take an image in the area of interest," Mandl says. Within hours, the software will send messages to satellites instructing them to gather the needed data, and then download and crunch that raw data to produce easy-to-read maps.



A "Google for satellites" type of web portal will allow users to request real-time data from Earth observing satellites.

For example, during the recent crisis in Myanmar (Burma) caused by Cyclone Nargis, an experimental gathering of data was triggered through Sensor Web 2.0 using a variety of NASA satellites including EO-1. "One thing we might wish to map is the salinity of flood waters in order to help rescue workers plan their relief efforts," Mandl says. If the floodwater in an area was salty, aid workers would need to bring in bottled water, but if flood water was fresh, water purifiers would suffice. An early and correct decision could save lives.

Thus far, Mandl and his team have expanded Sensor Web 2.0 beyond EO-1 to include three other satellites and an unmanned aircraft. He hopes to double the number of satellites in the network every 18 months, eventually weaving the jumble of satellites circling overhead into a web of sensors with unprecedented power to observe and understand our ever-changing planet.

To learn more about the EO-1 sensor web initiatives, go to http://eo1.gsfc.nasa.gov/new/extended/sensorWeb/sensorWeb.html. Kids (and grown-ups) can get an idea of the resolution of EO-1's Hyperion Imager and how it can distinguish among species of trees—from space at http://spaceplace.nasa.gov/en/kids/eo1_1.shtml .

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molecules of gas) by light from newly formed galaxies roughly 500-600 million years after the Big Bang. An open question is exactly how this reionization took place – leading theories are that a small number of the largest galaxies supplied the light, or that a huge number of tiny galaxies supplied the light. This new observation statistically supports that there were enough tiny galaxies to reionize the Universe.

Globular clusters – HST observed the Virgo cluster of galaxies, the nearest large galaxy cluster to us, looking for globular clusters, and found about 11,000 of them. Astronomers believe that the capabilities of HST allowed about 90% of all the globulars to be identified in the parts of the Virgo Cluster observed. The Virgo Cluster contains over 2000 galaxies and lies on average 54 million light-years away. Globular clusters typically contain hundreds of thousands of stars and orbit just outside their parent galaxy. Dense areas of the galaxy cluster were found to have larger numbers of globular clusters per galaxy than were areas with fewer galaxies. This was true even of dwarf galaxies, which were thought to have insufficient mass to hold very many globulars gravitationally. Astronomers theorized that this means that conditions soon after the Big Bang in areas that eventually produce dense collections of galaxies are much more proficient in producing globular clusters. This perhaps is due to greater concentrations of dark matter, which would aid gravitational collapse of gas clouds into stars and clusters. Astronomers have long known that the giant galaxy M87 near the center of the Virgo Cluster has more than its share of globulars. A long-standing question is how it got so many. The new observation showed that all galaxies within 130,000 light years of M87 had few if any globulars. Additionally the observation showed that 3/4 of the globulars orbiting M87 have stars that are poor in heavy elements (those heavier than helium), but M87 should have produced globulars richer in heavy elements. This implies that M87 got so many globulars by gravitationally stealing globulars from its neighbors, many of which are poor in heavy elements. The new observations also provided distances to 84 of the galaxies in the Virgo Cluster that were more accurate than those previously obtained.

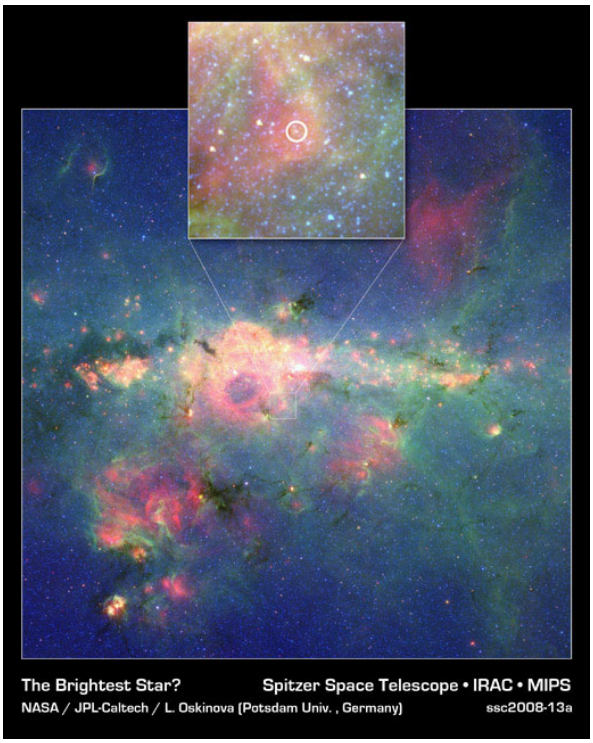
Barred spirals – A study of more than 2000 spiral galaxies using HST found that spiral galaxies with bars across their centers were far less plentiful 7 billion years ago than they are today. Only 20% of spirals in the distant past possessed bars, compared with nearly 70% now. The bars have formed steadily over the last 7 billion years. The recently forming bars occurred mostly in small, low-mass galaxies. The fraction of bars in the most massive galaxies was as high 7 billion years ago as now. The implication is that a bar forms faster the more massive the galaxy. Bars form when stellar orbits in a spiral galaxy become unstable and deviate from circular. Small elongations in their orbits grow until they get locked into place, making a bar. Bars force a large amount of gas towards the galactic center, fueling new star formation, building central bulges, and feeding massive black holes.

Galactic magnetic fields – Theory said that magnetic fields associated with galaxies should take billions of years to build up through a dynamo action. In a test of this, a team of scientists measured magnetic field of galaxies so distant that the light (both visible and radio) being measured left them up to 9 billion years ago. They found the magnetic fields of galaxies back that far were just as strong as they are today in nearby galaxies. Theorists now have to revise their theories to support magnetic fields of galaxies building to full strength at least 9 billion years ago. One possibility is that galactic outflows caused by supernovas help build up the magnetic fields quickly.

Polaris is a Cepheid variable star, though it does not vary much. About a century ago it varied only by 10% every 4 days, and since then the variability has been steadily dropping, reaching a mere 2% a few years ago. Astronomers had decided that Polaris was aging and leaving its variable phase. A recent check to see if variability had finally dropped to zero instead showed a 4% variation, and this is baffling astronomers. Further observations will be made to try to understand this.

Peony star – A star has been measured in infrared to be the 2nd brightest star (behind Eta Carinae) known in the Milky Way, at 3.2 million times the brightness of our Sun. It is nicknamed the Peony star, being located in a nebula known as the Peony Nebula, due to its resemblance to that flower. It is a Wolf-Rayet star, a giant blue star with a diameter roughly 100 times our Sun and originally a mass 150-200 times the Sun, though it is blowing away mass in a stellar wind at a terrific rate. In perhaps a million years it will explode as a supernova.

Themis – This fleet of 5 spacecraft observed the solar wind stretching the Earth's magnetic field until it snapped out in the Earth's magnetotail. This occurred at a distance 1/3 that of the Moon's. As the magnetic field reconnected, it launched 2 plasma bullets, gigantic clouds of protons and electrons, one toward Earth and the other away. The Earth-directed cloud crashed into our planet and caused vivid auroras. The other cloud shot harmlessly into space. The plasma bullets are half as wide as Earth and 10 times as long, traveling hundreds of mph. This is the first time this process has been observed.



Spitzer image of Peony Nebula

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to wind down around 10:30, and I think that everyone in the group got at least a few good pictures as a momento of a really satisfying and informative event.

If there are enough people interested in taking a class with Dennis, he would be willing to set up another OCA session. The minimum class size is 12. If you are interested, please email me at btoy@cox.net.

Great Developments at the Centennial Heritage Museum!

Our club has had a long-standing relationship with Centennial Heritage Museum (which some people may remember under its original name, the Discovery Museum). The nature of our involvement has changed over the years, and at this point the activities we have there regularly are the monthly Beginners Astronomy Class and the Astrophysics meetings. For most people, the museum is an undiscovered jewel in southern Santa Ana near Costa Mesa, and I commonly hear comments from newcomers to the sessions we hold there that they had no idea the museum was there. You can get a good sense for the museum and its programs and facilities from its website, http://www.centennialmuseum.org/.

The best-known feature of the museum is Kellogg House, a beautiful and historic Victorian home that was moved to the site from its original location and then renovated; it is central to many of the programs the museum runs for visiting classes (about 18,000 students visit the museum each year), where students can dress in period clothing and try out different activities that give them a hands-on sense of what it was like to live in the 1890s . A second historic Victorian home, Maag House, was also moved to the site several years ago but has not yet been renovated. There are also extensive gardens, including a rose garden and gazebo area, an orchard, a nature preserve, and an active blacksmith's shop (run by the Orange County Blacksmiths).

This last year has been very exciting for the museum. There has been an influx of talented new Board members, who have brought a lot of energy, imagination and resources to help put the museum on a better financial footing and develop its potential, and there have been some important additions to the museum staff. You can see the signs of positive change everywhere – a completely new building has sprung up to provide needed storage and working space, another building has been completely renovated as a classroom and multi-use facility, a new area with picnic tables has been built under the trees so visiting classes have an outdoor area where they can meet (and eat), the old classroom (which was in such poor shape it couldn't be repaired) has been demolished, the parking area has been reconfigured, one building got new windows and all of the main buildings are getting new paint – there are more improvements there all the time.

Some of these changes are directly benefiting us, as we now use the new classroom, which is clean, weather-tight, and very nicely finished – quite a contrast to the old classroom where we held the Beginners Classes and Astrophysics meetings for several years, and which was notable for such things as stuffed birds hanging from the ceiling, display cases in various states of disrepair, bins of recycled materials for crafts projects, a significant lack of temperature control, and (after the building was moved because of the construction of the new high school behind the museum), fountains of water that poured through the ceiling every time it rained. Even if you're one of those who become nostalgic remembering happy days in the old classroom, I think you'll quickly adapt to the comforts of the new facility!

I've got several reasons for bringing all this to your attention. One is that some people may not attend our meetings at the museum (particularly the Astrophysics meetings) because of concerns about the facilities based on experience with the old classroom – if you're one of these, please come and see the changes for yourself! Another is that the museum can always use volunteer help, and if any of you have some time and are looking for a good local cause, please consider the museum – and, even if you don't become a volunteer there, it's a great place to visit. A third reason is that the museum has had a series of really unique annual fund-raising events, and their next one is coming up on September 27 – the "Gangster Gala and Flapper Fling." Last year's event was the last evening on the Titanic, and was a resounding success, and this year's event should be even better. So, if you have that evening free, you might want to consider getting up a congenial party and going for an evening of good food, drink and 1920's-flavored fun – you can find the details on the museum website.

FOR SALE: brand-new items - 8'F/6 Discovery Optics 1.5" Pyrex Mirror cell; 8"University Optics Alum Mirror Cell; Vega-HP1-1.25"Focuser (Japan Made); Vega-3 Low Profile Helical 2" Focuser; 48 Rini2 Eyepiece in Bolt Case (this item not new but seems to be in good condition. Will sell these items seperately or as a package for $300.00. Contact Doug 562-598-6103

NIGHTFALL
DEEP SKY TREATS IN THE DESERT 2008

Thursday through Sunday
October 30 to November 2, 2008

Palm Canyon Resort
221 Palm Canyon Drive
Borrego Springs, California 92004

http://www.nightfall2008.com
info@nightfall2008.com

N I G H T F A L L B A S I C S

Nightfall 2008 is a four-day event held at a desert resort in Borrego Springs, California; this is the 16th annual edition. The resort supports the event by either switching off or changing to red all of the exterior lighting, and by making Nightfall the exclusive user of the property for its duration. There is no cost to come to Nightfall, but lodging or RV parking costs at the resort are the responsibility of the attendee (see below). You may also stay at a nearby hotel, or camp at the adjacent state park, and still set up on the main event grounds during Nightfall.

W H A T C A N I D O ?

You may attend Nightfall for one, two or three nights (minimum two-nights if you are staying at the Palm Canyon Resort). Many people make a mini-vacation out of it and come out on Thursday afternoon and stay until Sunday. Nightfall typically offers sunny, mid-fall days - great for exploring the nearby Anza Borrego Park; you can also attend workshops on astro-imaging and related topics during the day on Friday and Saturday (special registration/fees required). At night, there are several designated areas on the hotel grounds for telescope set-up; these areas have signs, and will be identified in the printed program. Large telescopes can be safely left outside, but participants are encouraged to keep cameras and other accessories in their cars, or take them back to their rooms, and you should provide protection against the sun and dust during the day. Other free activities during Nightfall include a Friday afternoon reception in the hotel saloon, a Saturday afternoon potluck dinner, and Saturday night sky tour.

H O W D O I R E G I S T E R ?

If you plan on staying at the Palm Canyon Resort, either in a hotel room or in the RV park, you need to call the resort at (800) 242-0044 or go online at www.pcresort.com. ***You should reserve early - the resort is often sold out by the end of summer.*** When calling, please tell the clerk you are attending Nightfall (aka “the telescope event”), or you may be told the resort is booked for the weekend. Rates this year range from $94 to $105 a night for rooms, and $28 to $34 a night for RV sites; both require a minimum two-night stay. If you are coming in an RV and want to have a separate space for your telescope gear, you must pay for that space. If you are interested in attending the astroimaging workshops on Friday or Saturday, please check the website - www.nightfall2008.com - for registration information and cost.

Magazine Subscriptions

Subscriptions to the Astronomy magazines are now due for renewal, if you subscribed for one year or would like to subscribe at the club rate. You may also extend an existing subscription that does not end in December for one year at the club rate. Bring your check made out to the OCA to the meeting or mail it to:
Charlie Oostdyk, Orange County Astronomers, PO Box 1762, Costa Mesa, CA 92628. ***Checks made out to the magazine publishers cannot be processed and will be returned to you***. If you already subscribe, please provide the mailing label or the billing invoice with your check. One-year rates are as follows:

	Club Rate	Regular Rate
Sky & Telescope*	**$33.00**	$42.95
ASTRONOMY	**$34.00**	$42.95

***Sky & Telescope subscribers please note: due to a change by the publisher, renewals of current subscriptions should now be made directly through Sky and Telescope! New subscriptions at the club rate must still be made through Orange County Astronomers and then renewed through the publisher.**

The **DEADLINE** for subscribing at the club rates will be the **October monthly meeting, October 10th.** The publishers will send expiration notices to all current club subscribers about November 1st even if you renew through the club. It takes the publishers a few weeks to process renewals.

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Hanny's Voorwerp – The Galaxy Zoo project invited members of the public to classify a million images of galaxies. Among the 150,000 volunteers to help on this project was Hanny van Arkle, a Dutch schoolteacher. She pointed out to project astronomers the existence of a large blob with a hole in it next to one of the galaxies (IC 2497). Further investigation showed it was a starless cloud of hot (10,000 degrees) gas, glowing from some unknown source of excitation. One possible explanation is that the nearby galaxy recently (in astronomical terms, say 100,000 years ago) hosted a quasar, whose powerful glow heated the nearby cloud until it glowed, and then the quasar shut down. It is apparently a unique object in astronomy, and has been termed "Hanny's Voorwerp" (Dutch for "Object"). Further investigation will be done.

Instant AstroSpace Updates

Analysis of electrical field data taken by **Huygens** while descending to the surface of Titan in 2005 shows patterns the same as static build up in Earth's atmosphere during electrical storms. Though lightning has not been directly detected on Titan, it probably occurs.

The last 2 descents from the International Space Station (ISS) using **Soyuz** spacecraft have both encountered failures during separation of the parts not meant to reenter, resulting in rough landings off target. So the cosmonauts onboard ISS, during a spacewalk, retrieved, from the Soyuz docked to ISS, one of the suspect explosive bolts that perform the separation, placed it in a blast-proof container, and will take it back to Earth for problem analysis.

SELENE (Japanese Moon mission) has imaged the halo left behind on the lunar surface when Apollo 15 blasted off. This is the 1st time it has been seen since the Apollo missions.

Launch of the **Lunar Reconnaissance Orbiter** and **LCROSS** (lunar impact mission), which share the same launch rocket, has been postponed from November this year to early 2009.

Operators of the **Large Hadron Collider** (LHC) located underground in Switzerland have announced that they will smash their first particles on September 11, but running only at 9% power, full power being expected in 2010. The supercooled portions of LHC have already been lowered to below 2° above absolute zero.

HST has been watching all 3 **red spots** on Jupiter as the baby spot approached the Great Red Spot, collided and was thrown out the other side. It is predicted that eventually the Great spot will consume the baby one.

New simulations of quantum mechanical effects occurring in gases at very high pressures and temperatures predict that **helium** should enter a **liquid metallic state** in the conditions existing in the centers of gas giant planets. It was already believed that hydrogen exists in a liquid metallic state there, with which the helium should form a liquid alloy.

SIRIUS ASTRONOMER
www.ocastronomers.org
The Newsletter of the Orange County Astronomers

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