SIRIUS ASTRONOMER

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The Newsletter of the Orange County Astronomers

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America mourns the loss of two space pioneers in the past month. Sally Ride (1951-2012), first American woman in space, passed away after a long battle with pancreatic cancer on July 23. Neil Armstrong (1930-2012), first man to walk on the Moon, passed away after complications from cardiovascular surgery on August 25. To honor these heroes, OCA offers a retrospective of both astronauts' lives on pages 6-7 of this issue as well as our heartfelt condolences to those they have left behind.

OCA CLUB MEETING

The free and open club meeting will be held September 14 at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. This month, Paul Wieland will discuss 'The Case for Increasing Our Exploration of Space'

NEXT MEETINGS: October 12, November 9

STAR PARTIES

The Black Star Canyon site will be open on September 8. The Anza site will be open on September 15. 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 7 at the Heritage Museum of Orange County at 3101 West Harvard Street in Santa Ana. The next two sessions will be on September 7th and October 5th.

GOTO SIG: TBA
Astro-Imagers SIG: Sep. 18, Oct. 16
Remote Telescopes: TBA
Astrophysics SIG: Sep. 21, Oct. 19
Dark Sky Group: TBA

A Brand New Age: Queue Observing at Mt. Paranal

By Dr. Marc J. Kuchner

First a caravan of white observatory cars arrives, winding up the narrow road to the 2600-m- (~8500-foot-) high summit. Then the shutters around the domes open, and rays from the setting sun alight on colossal mirrors and metal struts. It's the beginning of another busy night at Mt. Paranal, Chile, where I am learning about new, more efficient ways of managing a modern observatory.

European Southern Observatory at Mt. Paranal, Chile.

I stepped into the observatory's control room to soak up some of the new, unfamiliar culture. Here, under florescent lights and drop ceilings are banks of computer screens, one bank to control each of the four big telescopes on the mountaintop and a few others too. At each bank sits two people, a telescope operator and an astronomer.

The layout of this workspace was not unfamiliar to me. But the way these Mt. Paranal astronomers work certainly was. When I was cutting my teeth at Mt. Palomar observatory in California, I would only go to the telescope to take my own data. In stark contrast. everyone observing at Mt Paranal tonight is taking data for someone else.

The Mt. Paranal astronomers each spend 105 nights a year here on the mountain performing various duties, including taking data for other astronomers. The latter, they call "executing the queue." Headquarters in Germany decides what parts of the sky will have priority on any given night (the queue). Then the Mt. Paranal astronomers march up the mountain and carry out this program, choosing calibrators, filling the log books, and adapting to changing conditions. They send the data back to headquarters, and from there it makes its way out to the wider astronomical community for study.

This new way of working allows the Mt. Paranal astronomers to specialize in just one or two telescope instruments each. Surely this plan is more efficient than the old-fashioned way, where each of us had to learn every instrument we used from scratch—sifting through manuals at 3:00 AM when the filter wheel got stuck or the cryogen ran out, watching precious observing time tick away. Here at Mt. Paranal, much of the work is done in a big room full of people, not off by yourself, reducing some dangers of the process. Also, queue observing cuts down on plane travel, an important step for cutting carbon emissions.

It's a brand new age, I thought as I watched the giant domes spin in the silent, cold Chilean night. And maybe with queue observing, some of the romance is gone. Still, my colleagues and I couldn't help saying as we stared out across the moonlit mountains: I can't believe how lucky we are to be here.

Dr. Marc J. Kuchner is an astrophysicist at the Exoplanets and Stellar Astrophysics Laboratory at NASA's Goddard Space Flight Center. NASA's Astrophysics Division works on big questions about the origin and evolution of the universe, galaxies, and planetary systems. Explore more at http://www.science.nasa.gov/astrophysics/. Kids can explore these topics at http://spaceplace.nasa.gov/space .

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

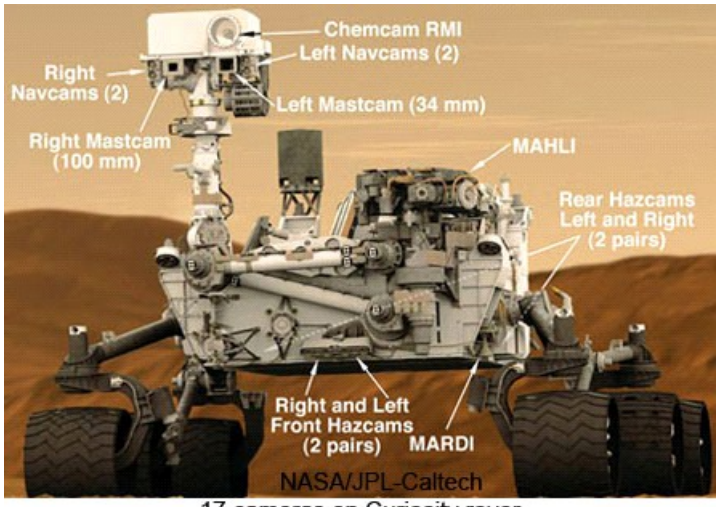
AstroSpace Update

September 2012

Gathered by Don Lynn from NASA and other sources

Twin divots, center, were created by the sky crane rockets during landing. The horizon is the Gale Crater rim, several miles distant. Pebbles on Curiosity's deck were kicked there during landing.

Curiosity (Mars rover / Mars Science Lab/ MSL) landed successfully inside 96-mile (154-km) diameter Gale Crater on the evening of August 5 (Pacific Time), ending a 36-week flight from Earth. The rover is scheduled to spend the next 2 (Earth) years investigating whether the landing area ever offered conditions favorable for microbial life. The huge mass of the rover (about a ton), the thin atmosphere of Mars, and weight limitations of a spacecraft forced mission designers into the most complex landing system ever used on the Red Planet. This included a heat shield to absorb heat of atmospheric entry (at about 13,000 mph = 21,000 kph), then a supersonic parachute, retro rockets, and a sky crane that lowered the rover by ropes onto the surface while hovering under rocket power. Then the ropes are cut and the sky crane crashes a safe distance away. The landing spot is near the central mountain of Gale Crater, named Aeolis Mons, but informally known as Mt. Sharp, which rises 3 miles (5 km), and is known to have many layers of geological history exposed. Observations from orbit have identified clay and sulfate minerals there, indicating a wet past. Curiosity is twice as long and 5 times as heavy as the previous rovers Spirit and Opportunity. It is powered by a nuclear-electric source, so does not depend on daylight for its power. Curiosity carries 10 science instruments with a total mass 15 times the science payload of either previous rover. Some of the tools are the 1st of their kind on Mars, such as a laser-firing instrument for checking elemental composition of rocks from a distance. The rover has a drill and scoop at the end of its robotic arm to gather soil and powdered samples of rock interiors, and parcel these samples into analytical instruments inside.

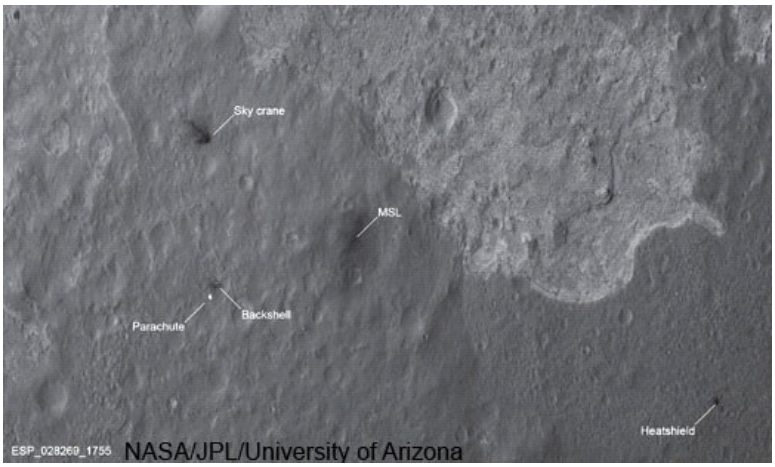


17 cameras on Curiosity rover

The 1st few days of **Curiosity** operation on Mars included instrument checkout, taking images of the area around the landing site, and deciding which objects seen will be investigated with the science instruments. The blast marks made by the sky crane during its hovering appear to have blown away surface dust down to bed rock, and that exposed rock is certainly on the list to investigate. Time is also being spent to send a brain transplant to Curiosity. As planned, the programs in the spacecraft computers that controlled cruise to Mars and descent and landing are being replaced by ones specialized to control the robotic instrument arm and roving, including autonomous identification and avoidance of hazards and obstacles.

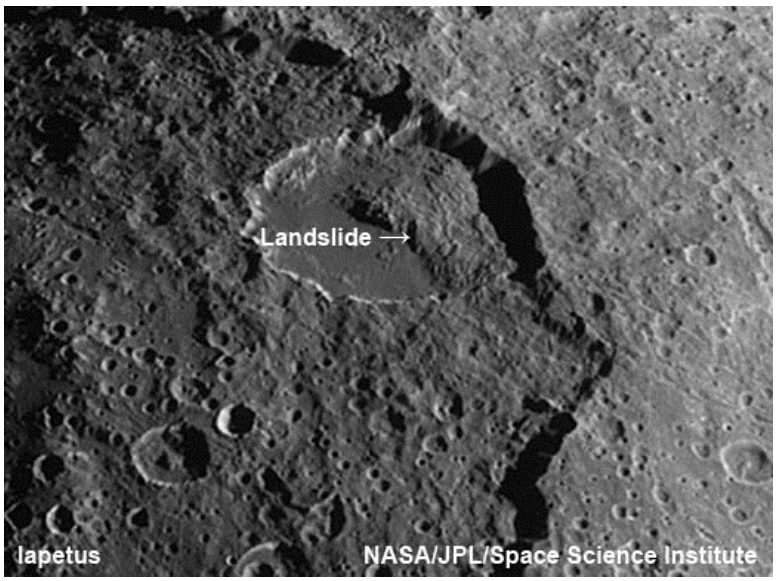
In mid-July, the orbiter **Mars Odyssey** went into safe mode due to a malfunction after adjusting its orbit. The adjustment was part of a plan to assure that Odyssey would be in position to watch the entire landing of Curiosity. The orbiter is planned to relay radio signals from Curiosity to Earth in real time during the landing. Mars Reconnaissance Orbiter (MRO) also has the capability to relay

the rover's signal to Earth, but only after a delay. Mars Express could also relay the signal, but is not aligned to see the entire landing, only part. Fortunately, spacecraft controllers were able to put Odyssey back into full operation and further adjust its orbit for perfect positioning before Curiosity's landing. Odyssey has been in orbit since October 2001, becoming the longest functioning Mars spacecraft ever.



MRO succeeded in taking high-resolution images of Curiosity during the landing, showing the parachute, the spacecraft, and the discarded spent heat shield, during descent to the surface. After the rover's landing, MRO imaged the landing site, showing the rover, sky crane, parachute, heat shield, and even discarded ballast weights. The blast marks from the sky crane hovering were seen.

Cassini (Saturn mission) has captured images of lightning on Saturn during the daytime. All previous visible-light images of Saturnian lightning have been at night. What that says is that this storm produced brighter lightning than previously seen. The brightness was measured to be comparable to the brightest of Earthly lightning. The visible power was estimated at 3 billion watts. The lightning was seen as bright flashes in clouds, with the flashes measuring roughly 100 miles (200 km) across. This indicates the actual flash was buried deeply down in the clouds, probably at the depth where water freezes. The lightning was most easily seen in blue-filtered images. More analysis is being done to determine why this is. One possibility is that the lightning was very blue, but other possibilities exist.



Iapetus (Saturnian moon) has more giant landslides than any solar system body except Mars. The moon is out of round, its impact basins are very deep, and there is a great mountain ridge around its equator, and these features contribute to the number of landslides. The problem is that many of the landslides are larger than they should be given the forces that set them in motion and that bring them to a halt. Most landslides travel a horizontal distance that is less than twice the distance the rocks have fallen. On rare occasions, however, a landslide will travel 20 or 30 times farther than it fell. Iapetus (as well as Earth) has some of these ultralong landslides. Something must be reducing friction in these cases, but there is no agreement about what that something is. A lot of proposals have been made, but many of the proposals do not apply on Iapetus (such as a cushion of air in the landslide). A new study was made of Cassini images of Iapetus to look for evidence of fracturing caused by the stresses of being out of round. The study did not find much fracturing, but did find a number of landslides. The surface of Iapetus is mostly ice, but at very low temperatures found there, ice acts much like rock does on Earth. The landslides on Iapetus were measured and the coefficient of friction necessary to have stopped them at their present size was calculated. Most were around 0.2. But laboratory measurements of friction in fractured ice at the temperatures and pressures found on Iapetus came up at about 0.6. Clearly that something reducing friction is acting on Iapetus. Further work will be done to help pin down what reduces the friction in those ultralong landslides. This work may help understand motion along faults on Earth, which can exhibit unexpectedly low friction during Earthquakes.

Lunar swirls – Scientists have solved a lunar mystery. The new work focused on the enigmatic "lunar swirls", swirling patches of relatively pale lunar soil, some measuring several tens of miles across. Lunar Prospector 1st identified magnetic anomalies on the Moon. It was thought that these magnetic areas were somehow preventing particles from space from hitting and darkening the lunar

surface, resulting in the pale color. But the magnetic field did not seem strong enough to do that. The new work used a solar wind tunnel that duplicates solar wind particles in a laboratory vacuum tank. It was found that an electric field exists wherever the magnetic field strength changes rapidly from place to place. The electric field was found strong enough to deflect particles to the extent necessary to protect lunar soil from darkening. Future work will attempt to determine if this effect could be used to protect future lunar astronauts from space particle radiation.

Planet formation – Astronomers have long puzzled over the Earth's water deficiency. Most simulations of planet formation end up with our planet being covered by far deeper water, since it should have formed beyond the "snow line". That is the distance from the Sun during planetary formation beyond which water ice is stable. Planets forming past that line have huge amounts of water. A new simulation of planetary formation appears to have solved the mystery. The new simulation showed that the disk of material out of which planets were forming did not completely ionize, as previous simulations had assumed. This results in a zone where material bunches up instead of falling inward. This zone extends from about 0.1 astronomical unit (AU) to a few AU from the Sun. The bunched-up material heats up from friction and drives the snow line farther out from the star than previously thought. So the Earth (and in fact Mars) would then form where it was too hot for much water to exist. After those planets form, comparatively little water is added from objects (comets or icy asteroids) deflected from farther out.

Voyager 1 (former outer planet mission) has measured fast changes in 2 of the 3 parameters expected to reverse at the boundary of the solar system. In 1 day in July, data from the cosmic ray instrument showed the level of the type of cosmic rays from outside the solar system jumped by 5%. During the same day, the level of particles from inside our solar system dropped by half. However, in 3 days the levels had recovered to near their previous levels. Scientists believe these abrupt changes indicate Voyager 1 is nearing the edge of the solar system. The 3rd parameter is magnetic field, and that data is still being analyzed.

Small exoplanet – Astronomers using the Spitzer infrared space telescope have detected what they believe is a planet 2/3 the diameter of Earth. It is still being called an exoplanet candidate, dubbed UCF-1.01, until further confirmation is made. It is located only 33 light-years away. Only a handful of exoplanets smaller than Earth have been found so far. The discovery came while using Spitzer to observe another planet already known to orbit the star (known as GJ 436). UCF-1.01 revolves quite close to its star, only about 7 times the distance that the Moon is from Earth. Its year lasts only 1.4 Earth days. Its surface temperature must exceed 1000 °F (nearly 600 °C). If the planet ever had an atmosphere, it almost surely has evaporated. It may even be hot enough to have a melted surface. The Spitzer data shows hints of yet a 3rd planet orbiting the star. It is not clear how to confirm these 2 exoplanet candidates, since their masses must be too small to gravitationally affect the motion of their star perceptibly to a spectrograph, the most common way to confirm planet candidates found by the transit method.

Massive stars – In 2010, scientists discovered 4 monster-sized stars, up to 300 times the mass of our Sun, located in the giant star cluster R136 in the nearby galaxy the Large Magellanic Cloud (LMC). No stars this massive have been found anywhere else. Until the discovery of these objects, observations suggested that the upper limit for stars formed in the present-day Universe was about 150 times the mass of the Sun. A group of astronomers now believes they have explained how these stars in R136 formed so large. The LMC, at a distance of 160,000 light-years, is the 3rd-nearest satellite of the Milky Way Galaxy and contains about 10 billion stars. The LMC has many star-forming regions, with the most active being the 1000-light-year-wide Tarantula Nebula, also known as the 30 Doradus complex, which contains the cluster R136. This cluster is the brightest stellar nursery in the entire Local Group of more than 50 galaxies. The new study made a computer simulation of an R136-like cluster, but populated with stars of the usual range of masses, without the super-heavy ones. With so many massive stars, many in tight binary pairs, there are frequent random encounters, some of which result in collisions where 2 stars coalesce into heavier objects. The resulting stars can then easily end up being as massive as those seen in R136.

Massive binaries – A new study using the Very Large Telescope in Chile has shown that most very bright high-mass stars have companion stars. Almost ¾ of the stars in the study were found to have a close companion star, far more than previously thought. Surprisingly most of the pairs are also experiencing disruptive interactions, such as mass transfer from 1 star to the other. About 1/3 are expected to ultimately merge to form a single star. The study looked at O-type stars, which have very high temperature (over 54,000 °F = 30,000 °C), mass (15 or more times that of the Sun) and brightness (up to 1 million times the Sun's). 71 stars were studied in 6 nearby young star clusters in the Milky Way. The companion stars were found by their effects on the spectra of the stars.

(continued on page 8)

IN MEMORIAM: SALLY RIDE 1951-2012

Sally Ride, pioneering astronaut, has died of cancer at age 61. She was the 1st American woman in space (after 2 Soviet women). She rode to orbit twice aboard the Shuttle Challenger, in 1983 and 1984, both missions to deploy satellites. She was an expert with the Shuttle arm, which she used to deploy and retrieve satellites. She was training for a 3rd mission when the Challenger disaster intervened. She was the only person who served on both the Challenger investigation and the later Columbia investigation. Ride earned degrees, including a PhD, from Stanford. She was chosen to be part of the 1978 class of astronauts, the 1st to accept women, and trained for 5 years before going into space. After leaving the space program, Ride joined the faculty at the University of California, San Diego, as a professor of physics and director of the UC California Space Institute. In 2001 she founded a company, Sally Ride Science, to motivate girls and young women to pursue careers in science, math and technology. OCA participated in a few events presented by Sally Ride Science in Orange County. Ride was inducted into the National Women's Hall of Fame and the Astronaut Hall of Fame.

(right) Sally Ride on the middeck of Space Shuttle *Challenger* during STS-7, June 23, 1983. Source: NASA

(left) Sally Ride communicates with ground control from the flight deck of *Challenger* during STS-7 (June 18-23, 1983). Source: US Information Agency

EDITOR'S NOTE: The August issue of the Sirius Astronomer had already been submitted to the printer at the time of Dr. Ride's death. This tribute therefore was given priority for the September issue. No disrespect is intended toward the memory of this great woman.

IN MEMORIAM: NEIL ARMSTRONG 1930-2012

Armstrong in a Gemini 8 publicity photo (NASA)

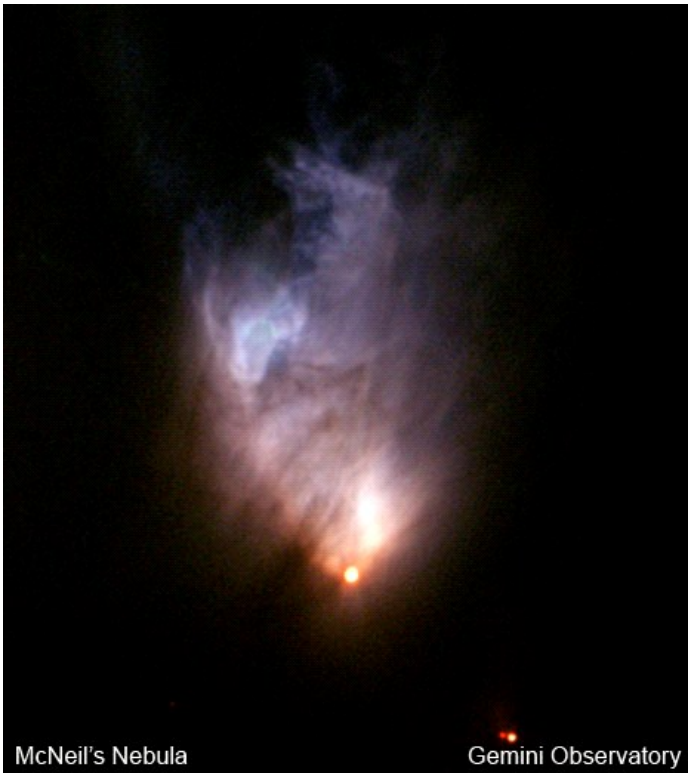
Neil Armstrong, first man to walk on the Moon, passed away on August 25 at age 82 from complications arising from cardiovascular surgery. In addition to the Apollo 11 landing which immortalized his name, Armstrong was also Command Pilot on the Gemini 8 mission, in which he successfully recovered the capsule from a serious malfunction in its Orbital Attitude and Maneuvering System and averted what could have been a disaster. Armstrong, a graduate of Purdue University, was a consummate aviator and engineer, logging over 2400 hours in 200 different types of aircraft even before he entered the space program as part of the second class of astronauts in 1962. In addition to the Gemini and Apollo programs, Armstrong was an X-15 pilot (setting an altitude record of 207,500 feet in September 1962) and flew 78 combat missions as a Naval aviator during the Korean War. After retiring from NASA in 1971, Armstrong was a professor of aeronautical engineering at the University of Cincinnati and served on several corporate boards including Learjet, United Airlines, and Thiokol, and as a spokesperson for several American companies including Chrysler. Armstrong along with Sally Ride served on the board of inquiry for the Challenger disaster (he had earlier been a part of the investigation into the Apollo 13 mission). Despite being the first man to walk on the Moon, very few pictures of Armstrong on the Moon were taken—he was the primary photographer for the mission. Given his many accomplishments, however, Armstrong was a humble man who eschewed the limelight and insisted that embracing celebrity would only detract from the contributions of the many thousands of people who had made his achievements possible. Nonetheless, he remained deeply involved behind the scenes in promoting space exploration and science education.

"For those who may ask what they can do to honor Neil, we have a simple request. Honor his example of service, accomplishment and modesty, and the next time you walk outside on a clear night and see the moon smiling down at you, think of Neil Armstrong and give him a wink." — statement from the Armstrong family. All of us at OCA are sure to oblige!

"One small step for (a) man...one giant leap for mankind." Neil Armstrong stepping onto the lunar surface—and into posterity—on July 20, 1969 (NASA)

(continued from page 5)

Until now, astronomers mostly considered that closely orbiting massive binary stars were the exception, something that was needed only to explain exotic phenomena such as X-ray binaries, double pulsars, and black hole binaries. The new study shows they are common. Because massive stars affect galaxy development with winds, shocks and supernovas, this higher proportion of massive binaries will have to be accounted for in galaxy development theory and simulations.



McNeil's Nebula – X-ray observations have revealed that the young star that illuminates McNeil's Nebula has 2 X-ray-emitting spots, where gas flows from a surrounding disk. The protostar (star still under formation) rotates about once a day, or 30 times faster than the Sun. The protostar, known as V1647 Orionis, 1st made news in 2004 when it erupted and lit up the surrounding nebula, which became known as McNeil's Nebula, after the amateur astronomer who reported finding it. It is 1300 light-years away in a region of active star formation within Orion. The initial outburst died down in 2006, but then erupted again in 2008 and has since remained bright. New analysis of 6 years of observations of V1647 Ori from Chandra, Suzaku and XMM-Newton (orbiting X-ray telescopes) showed cyclic X-ray variations, indicating the rotation rate. It is rotating so fast that it is barely able to hold itself together, nearly at break-up speed. Infrared studies have shown the star is no more than a million years old, probably much younger. Gas is expected to channel from the surrounding disk for millions of years. Finally it will be able to fuse hydrogen into helium in its core and become a mature star. The hot spots are calculated to be about the diameter of the Sun. The star itself is nearly 5 times the size of the Sun. It is believed that the spots are constrained by magnetic fields. X-ray outbursts are probably the result of interplay between the magnetic fields of the star and the disk. Simultaneous observations in X-rays, visible light and infrared show that the X-ray emission is tied to accretion of material. That theory had been proposed in 2004, but it took these new observations to confirm it. More observations of the object are planned in infrared, using the Spitzer space telescope.

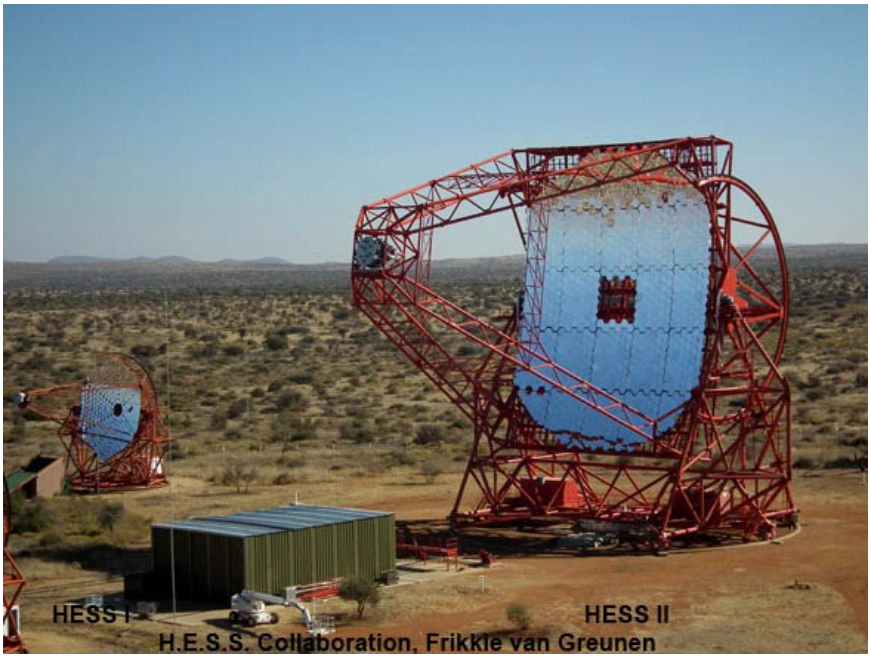
Supernovas – Based on recent computer simulations of massive stars exploding as supernovas, researchers agree that such explosions would not succeed as spherically symmetric events, so multidimensional simulations are needed. These latter suggest that there are 2 possibilities for how the explosions occur: 1) an explosion facilitated by rotation with polar symmetry, or 2) a clumpy shape in 3-dimensions driven by convection (hot spots boiling up to the surface). New computer simulations of these 2 possibilities show that polar shaped ones would have a single axis of emitted polarized light, while the clumpy ones would have various angles of polarization. A team using the Subaru Telescope in Hawaii measured the polarization of the light from 6 massive supernovas and found 5 of them showed the signature in polarization of clumpy explosions. The 6 supernovas were selected to be stripped-envelope ones (lost their outer hydrogen before exploding), as they are easier to observe in polarized light. So at least for stripped-envelope massive stars, the clumpy explosion seems to be the most common method of exploding. The polar shape had been the leading theory until now.

Gamma-ray pulsar – Using ingenious data analysis methods, researchers found a gamma-ray pulsar in data from the Fermi Gamma -ray Space Telescope. It emits no detectable radio waves. During the gamma-ray observation period, it experienced the largest glitch (change in rotation rate) ever observed for a gamma-ray only pulsar. Such pulsars are difficult to identify because from only gamma rays, the exact position in the sky and the period of rotation cannot be directly measured. The newly discovered pulsar is, at 5000 years old, very young. It rotates roughly 7 times per second, and is located in Scutum. When the glitch occurred, astronomers at first thought the pulsar had disappeared. But when it was guessed that perhaps a glitch had occurred, searches of the data at new rotation rates was able to relocate the pulsing signal. It is thought that such glitches are caused by shifts in the structure of the neutron star, but the exact nature of such shifts is not known.

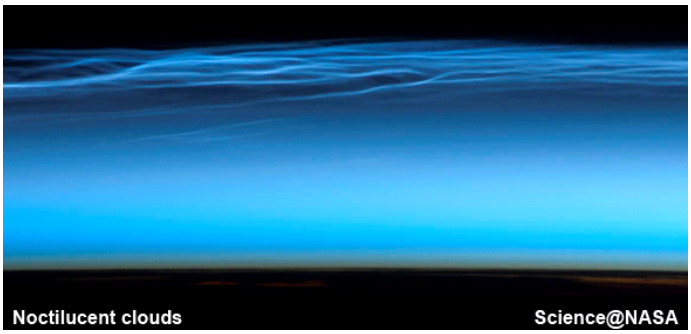
Oldest (farthest) spiral galaxy – A spiral galaxy has been discovered so distant that it took light 10.7 billion years to reach us. Other galaxies from this early in the history of the Universe are clumpy and irregular, not symmetric. The spiral was found in an observation of 300 very distant galaxies by the Hubble Space Telescope. Further observation with a state-of-the-art spectrograph on the Keck Telescope in Hawaii showed that the object was rotating as a spiral, not some illusion that only looked like a spiral. There is a dwarf galaxy nearby, and computer simulations of galaxy formation show that encounters with the dwarf galaxy could cause the spiral shape to form more rapidly than normal.

Sky Survey – Astronomers have constructed the largest-ever 3-dimensional map of massive galaxies and distant black holes. The map was produced as part of the Sloan Digital Sky Survey III (SDSS-III). It includes galaxies out to distances such that we are seeing them as they were 7 billion years ago, and quasars out to 12 billion years ago. Their distances have been calculated from the redshifts of their spectra. The new map includes images of 200 million galaxies and spectra of 1.35 million galaxies. With such a map, scientists can retrace the history of galaxies in the Universe over the past 7 billion years, and that of quasars over the past 12 billion years. With that history, astronomers will be able to better estimate how much of the Universe is made up of dark matter and dark energy. The newly released SDSS data also includes more than half a million stars in our own galaxy.

Extreme resolution observation – A team of astronomers has observed the heart of a distant quasar (3C 279) with unprecedented sharpness by linking 3 submillimeter radiotelescopes together to form an interferometer. The 3 are the APEX in Chile, SMA in Hawaii, and SMT in Arizona. The quasar consists of a black hole with about a billion times the mass of the Sun, which is rapidly accreting matter. It is so far that its light takes 5 billion years to reach us. Using very short wavelengths of radio (1.5 millimeters), coupled with the wide separation of the telescopes, results in extremely fine resolution of 28 microarcseconds, or 36,000 times better than good visible-light resolution. This amounts to about a light-year at the distance of the quasar. Achievement of this resolution is a crucial step in a project to eventually resolve the event horizon of a black hole.



HESS II (gamma-ray telescope in Namibia) has begun operations. The HESS I consists of four 12-meter Cherenkov telescopes, while the new addition is a 28-meter one, the largest ever built. Computers calculate the gamma rays that must have hit the upper atmosphere in order to produce the showers of subatomic particles that are observed streaking through the air producing Cherenkov radiation, a glow given off by particles exceeding the speed of light in a medium (the air). This allows observation of gamma rays from the ground, even though the Earth's atmosphere stops gamma rays. Researchers believe gamma rays are produced by natural cosmic particle accelerators, such as supermassive black holes, supernovas, pulsars, binary stars, and maybe relics of the Big Bang. There are well over 100 known cosmic sources of gamma rays. It is hoped that HESS II, with its superior sensitivity and resolution, will help pin down what kind of objects are emitting the gamma rays from the many known sources for which no observations in other wavelengths have turned up any object.



Noctilucent clouds (NLCs), those electric-blue ripples and tendrils that reach across the night sky, particularly at high latitudes during summer, have been found to contain meteor smoke, the remnants of meteors that have burned up high in the atmosphere. This supports the theory that NLCs form their ice crystals about meteor smoke as a

nucleating agent. About 3% of each ice crystal in an NLC is meteoritic. It is no coincidence that NLCs form at the altitude (about 52 miles = 83 km) that meteors burn up. Nucleation of clouds happens all the time lower in the atmosphere, but typically about airborne dust or even microbes. The NLC ice crystals are much smaller than those at lower altitudes, and this causes them to scatter more blue light, and give NLCs their color.

Instant AstroSpace Updates

A very long exposure by **Chandra** has discovered X-rays being emitted by the remnant of a supernova that was seen to explode in 1957 in the galaxy M83, despite previous X-ray observations coming up empty. The X-rays suggest that a neutron star was left by the supernova, though such has not been detected by other types of observations.

Opportunity (Mars rover) has traveled 21.5 miles (34.6 km) since its landing in 2004. It was designed to run 3/8 mile (0.6 km) and 3 months.

This unique image of Venus, the Moon, Jupiter, and the Pleiades in alignment was taken by Jim Windingler on August 13 using a Canon XTi (400d) imager with a Sigma 20mm lens at ISO 1600 and a 15-second exposure at f/2.5. Neatly bisecting the alignment is a Perseid meteor.

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**	$37.95
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 12th.** 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.

FOR SALE

Meade ETX-125C telescope with carrying case, tripod, autostar finder system and other accessories. $600 or best offer.

Contact Barbara Mays 562-439-7468

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HANDY CONTACT LIST

CLUB OFFICERS (to contact the entire board at once, send an email to board@ocastronomers.net)

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