SIRIUS ASTRONOMER

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The Newsletter of the Orange County Astronomers

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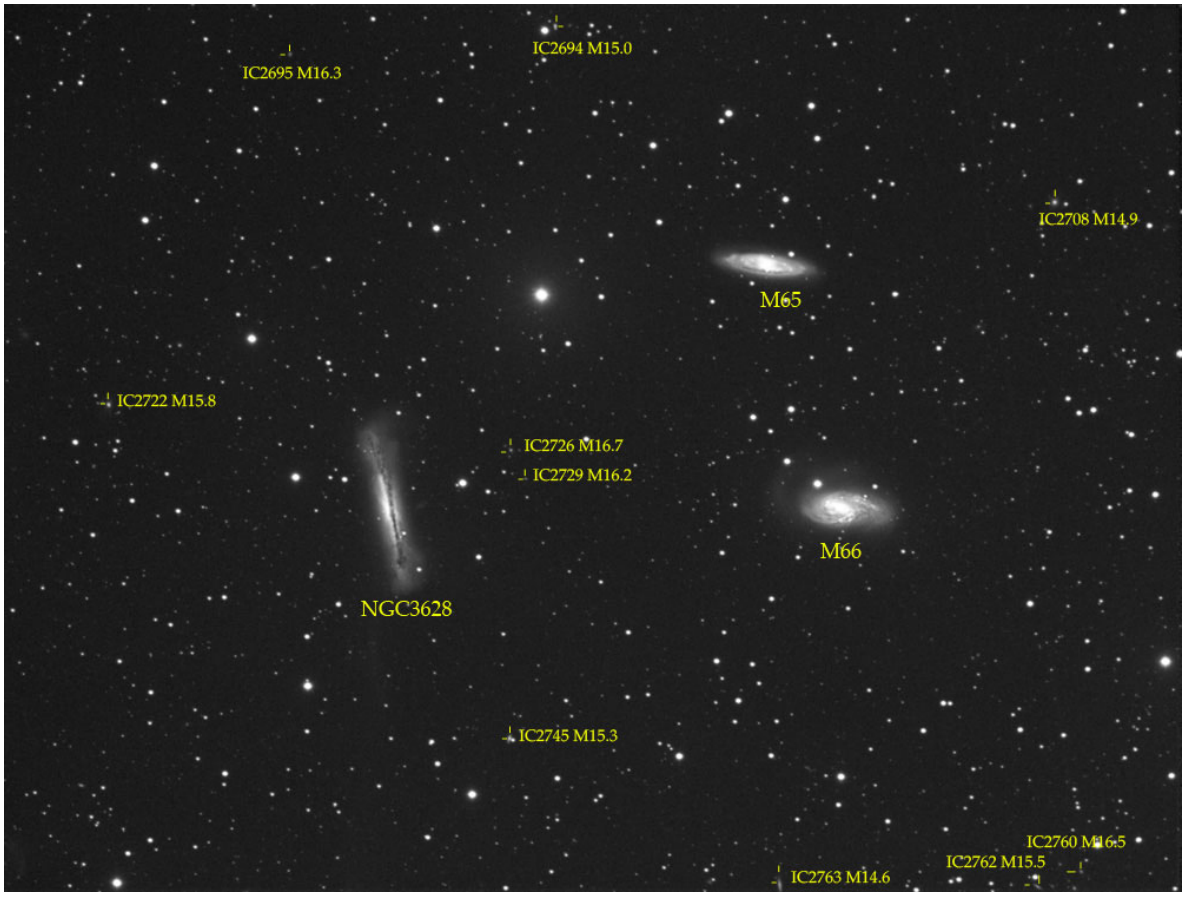

Alan Smallbone captured this image of the Leo Triplet (M65/M66/NGC3628) through thin clouds during the Messier Marathon on March 28, 2009. Unfortunately, high clouds ended this year's Marathon early, but hopefully the weather will be better for the alternate date, this month's Anza Star Party on April 25.

OCA CLUB MEETING

The free and open club meeting will be held Friday, April 10th at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. This month, Dr. Geoffrey Burbridge of UC San Diego will discuss current problems in cosmology.

NEXT MEETING: May 8th

STAR PARTIES

The Black Star Canyon site will be open on April 18th. The Anza site will be open on April 25th. 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, April 3rd at the Centennial Heritage Museum at 3101 West Harvard Street in Santa Ana.
GOTO SIG: TBA
Astro-Imagers SIG: Apr. 21st, May 19th
Remote Telescopes SIG: Apr. 22nd, May 27th
Astrophysics SIG: Apr. 17th, May 15th
Dark Sky Group: TBA

April 2009 President's Message

By Barbara Toy

April tends to be a month of contrasts – warmer days and nights, wildflowers and other joys of spring, but also income tax, property tax and related irritants that most of us would prefer to forget. On the bright side, at least some areas have been having a very nice bloom of wildflowers this year, much better than the last couple years – I hope you've had a chance to enjoy them!

Sad to say, as time goes on more and more of our members and their families and friends are affected by the current horrible economic conditions. I've talked to many members who've been laid off, forced into earlier retirement than they'd been planning, suffered salary cuts, had retirement funds severely slashed by drops in stock and other prices, or have even been working without pay. Some who have lost their jobs have found other employment, others are still searching. Craig Bobchin, our vice president, and I have both been among the fortunate – we both lost our jobs in December, but have been able to find other positions. Others have not been so lucky, and I know some who are still looking many months after being laid off. The stress for them is incredibly high, and, if you happen to know anyone in that situation or find yourself in the company of someone in that situation, please give them a sympathetic ear and any encouragement you can.

All of you who are struggling in this economy have my deepest sympathy, and I hope things improve for you – sooner rather than later. The club meetings and socializing with fellow club members may help give you a mental break from the stresses of job-hunting or otherwise dealing with these economic woes, and you may even pick up some leads on job possibilities or other ways of improving your situation, as our membership is very diverse and many people have information or personal experience that could be helpful. I'm not suggesting that you should actively hit your fellow members up for job leads by any means – that would be no joy to either side and probably counter-productive – but it's amazing how helpful bits of information will often surface in conversations under the stars or at various club events.

Anza update

As of this writing in mid-March, Gary Schones has started clearing the area where the next group of observatories will go, and hopes to finish it by early April. Unfortunately, we found when he cleared the first area that, where we had hoped to have room for three or four observatory sites, there was only room for two. This means that we will most likely have to use the entire area below the current member observatory level for observatories sites, and the people who have been using the Last Members area will have to move their operations somewhere else, such as the current RV area above Anza House, to have similar accommodations to what they've been used to in the Last Members area.

If you've been out at Anza much over the years, you've probably noticed that the RV area has generally been underutilized, even though it's close to Anza House, most likely because we don't have power there yet. Our long-term plans for the RV area are to put in another Football Field-type facility, with power and concrete pads for general membership use and easy access to Anza House. Those of you who use the Football Field regularly know that it often gets quite crowded, especially during the summer star parties or when we have special viewing events such as good (or at least well-publicized) meteor showers that conveniently happen on Friday or Saturday nights, the Messier Marathon, or promising comets, so an additional general-use pad area would definitely be useful.

We don't have a specific timetable in mind for this new general-use facility yet – getting the new member observatory area set up has greater priority right now because we've been promising it for a long time and the people who are building in the new area will be bearing the costs associated with the development so we won't be depleting the club's reserves. However, if you have an interest in working on development of the RV area, please let me know – there's nothing like having an enthusiastic group focusing on a project to get it moving!

Water at Anza

While we regularly mention the fact that we can't get trash service at our Anza site, which is why people have to take their trash out with them when they leave, we haven't said much over the years about our water or sewage systems out there. Just as there is no available trash service, there is no municipal water or sewer service, so our water comes from a well on-site that the club had drilled years ago and has to maintain, and our sewage goes into septic tanks, one for Anza House and one for the club observatory.

Our water at Anza recently became an issue when the relief valve on the pump for the well broke. This meant that there was no relief system in case the system had a blockage, which could lead to the pump burning out and a very expensive repair. The pump therefore had to be turned off until Don Lynn could get a replacement valve to make the repair, which meant that the only water we had available on the site until the repair was made was what was stored in the water tank at the top of the property. Don suspects that the valve broke because of a blockage caused by ice in the water line; ice isn't a problem right now, but the water from our well has a lot of small bits of gravel in it, which can also cause blockages (these bits of gravel cause us a lot of problems in other areas as well, such as toilet valves).

Don Lynn had to hunt around for a replacement valve, which was not the easiest item to find as the pump is on the elderly side, but he did find one and it should be installed and the pump fully operational at March star party. The effects of this particular problem should be history by the time you read this, but the episode demonstrates how we are dependent on various systems at Anza that require regular repair and maintenance. Although there's more development out there now than in the early years of the site, it's still not a neighborhood where you can easily get a plumber to come take care of a problem without paying a lot for the service and travel time, so it really pays to be self-sufficient out there. Fortunately, thanks to handy and helpful members like Don Lynn, Gary Schones, Jim Hannum and others, we generally have been able to handle maintenance and repair problems without having to call in outside help (though we did have an exterminator come in to take care of a hive of bees that set up housekeeping in the club observatory a few years back, and professionals are definitely the way to go when the septic tanks have to be pumped!). I hope we continue that way.

There was actually a bit more to the story about the broken valve – Jim Hannum and John Kerns, two of the three members who own the property across the street from our Anza property, noticed that there was a big pool of water behind (and under) Anza House on the day before the February star party (due to the weather, that "star party" was extremely lightly attended – fortunately, as things turned out). This was ultimately traced to a broken water line on the swamp cooler at the back of Anza house, which probably broke due to freezing. They discovered the broken valve on the pump in the process of attempting to turn off the water, a process that required multiple phone calls with Don Lynn and Gary Schones as they attempted to locate shut-off valves for Anza House itself.

After Don got out there and he and Jim did some further checking, they learned that the valve controlling water for the swamp cooler is clogged, so it wouldn't shut off completely (most likely a victim of gravel in the water), and the shut-off valves that were originally installed on the lines coming into Anza House were somehow eliminated when Anza House was replumbed by another generous member a number of years ago. So, the Anza House repair plans now include putting in new water shut-off valves on the lines going to each of the two coaches that make up the house, and repairing the water line for the cooler so it'll be back in operation by the time the weather warms up.

One point of the story is that we owe a lot to our generous member-neighbors, Jim Hannum, John Kerns and Dave Radosevich, who make it a practice to patrol our site regularly when they're out there and to make us aware of any problems – and they take care of a lot of the problems they observe themselves if they can. We also owe a tremendous amount to Don Lynn, who has been our Anza Site Custodian for over 20 years, and who has an incredible ability to get things working again when they die and to work around problems to keep things functioning – he told me once jokingly (I think) that it takes a Ph.D. to deal with the plumbing at Anza, and there are times I think he was erring a bit on the conservative side with that comment.

It certainly takes a lot of specialized knowledge as well as energy and time to keep things like the well, the entire plumbing system, and everything else at Anza up and running. If you have experience with plumbing or electrical systems in particular, Don could really use some assistance and it would be helpful for all of us to have other people acquire some of his extensive knowledge about the site and its workings by working with him – we would really like to get a maintenance team together to relieve some of the pressure on Don. So, if you are interested in being part of such a team, please contact either Don at (donald.lynn@alumni.usc.edu) or me at btoy@cox.net.

Some More Club History...

Jim Leonard, one of the folks who was involved in a precursor organization (OCAA) to our current OCA, kindly gave us his recollection of the very early stages of development of an astronomy club in Orange County, which was featured in last month's President's Message. One interesting result of that write-up is that Art LeBrun, an OCA Charter Member who was there at the club's beginning – a different beginning – gave me an account of his experience with the early days of the organization (OCAAA) that ultimately made the formal transition to become OCA. He suspects that the events that Jim Leonard described took place a few years earlier than the events he was involved in; clearly the experience of both of them shows that there was a lot of interest in astronomy in Orange County in the 1950s, 60s and 70s, which is undoubtedly a major factor in helping OCAAA/OCA to grow into such a strong and diverse organization.

Here is Art's account of the beginning of the OCAAA and how it made the transition to OCA:

> In Sept 1967, Chuck LeBrun and I posted a notice in Sky & Telescope's list of astronomy clubs of a club in Anaheim, California that did not [yet] exist, using Chuck's address and phone number. After a number of phone calls inquiring about OCAAA we set up the first meeting at Chuck's house on Harriet Lane for November 1967 and essentially started the club. Eventually OCAAA became OCA as part of the effort to obtain a grant from the Irvine Company for an observatory and was incorporated about the same time (1971).

Art emailed me a copy of an announcement of the Five Year Anniversary of OCAAA from 1972, that gave a few more details, such as that the first meeting was actually in Chuck's garage. Per this very interesting document, in 1972 John Sanford was President, Vic Wagner was Vice President, Katie Wagner was Secretary and Tom Bailey was Treasurer. In 1968, these positions were held by Chuck LeBrun (OCAAA's first President), Art LeBrun, Mike Hoffert and Elaine Goff, and it seems that there was a group of active members who traded off holding these positions over those first few years, based on the officers listed for each of the first five years in the announcement.

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AstroSpace Update

April 2009
Gathered by Don Lynn from NASA and other sources

Phoenix (recently completed Mars lander mission) – Examination of images taken of the lander legs on Phoenix show what appears to be drops of liquid water that lasted for months, grew, moved and merged. Some of the Phoenix team believe that salts found on Mars, particularly perchlorate salts, could lower the freezing point of water enough that liquid water is the explanation for these images. A few disagree and say it has to be frost. The temperature measured during the mission varied from -4 to -112° F. The pro-liquid group claims that salty liquid water must be common in the soil also. Salty liquid in the soil is consistent with radar signals of large areas from orbiting spacecraft, and with water-based alterations found in some Martian meteorites. Unfortunately the images of the globs on Phoenix are not very high resolution, leaving room for doubt.

Mars rover Spirit started its trek to a mound called Von Braun and a bowl named Goddard in order to spend much of the Martian summer analyzing the rocks and soil there. The first attempt was to climb about 5 feet to the top of the Home Plate plateau and cut directly across it about 200 yards to the destinations. But the climb was over soil too loose for the slope, requiring the rover to back down and try another route. The second route was also too loose, so controllers decided to go around Home Plate instead of over. On the way around, the rover got interested in another patch of soil, named Stapledon, so stopped and analyzed it, finding silica. That is usually a sign of past hot water activity.

Mars rover Opportunity continues its long journey to Endeavour Crater. Engineering data showed signs of increased friction in one wheel. So controllers drove it backwards for a few days. That has, in the past, redistributed lubricant in the wheel and cured such problems.

Mars water – A gully has been found on Mars that was eroded by flowing liquid water, resulting in material spreading out in a fan at the bottom of the gully. What makes this gully unique is that one section of the fan is cratered allowing its formation date to be determined, which was found to be only 1.25 million years ago. The craters in the fan appear to be from material thrown out of a nearby rayed crater, which has been dated reliably at 1.25 million years ago. Most water-formed features on Mars that have been dated are billions of years old. This newly studied gully is by far the youngest water-formed feature reliably dated. Further, the fan shows that it was formed in at least 4 separate flow incidents, and the other 3 sections are newer than the one dated by craters. The 4 flows were probably not long-lasting, as no substantial pond appears to have formed below the fan. The flows may have occurred from sudden meltings of ice or snow. The team making the discovery believes they have ruled out other possible explanations for the flows.

Cassini (Saturn mission) has found within the G ring a tiny moon embedded within a brighter arc of the ring. It is believed that the moonlet is emitting the particles that make up the arc and the whole G ring. The moonlet is estimated from its brightness to be 1/3 mile across, though it is smaller than one pixel in Cassini's camera. Gravitational interactions with the nearby moon Mimas constrict particles to the arc area. The arc is 150 miles wide and extends 1/6 of the circumference of the ring.

Cassini mapped the dune fields on Saturn's moon **Titan**, and used their directions as weather vanes to determine which way **winds** predominantly blow at each dune area. Radar data clearly show dunes. The winds generally blow in the opposite direction from what computer models predict. The dunes are believed to be made of hydrocarbon sand grains, unlike the silicate sand of Earth. Dunes on Titan are generally in the equatorial regions, probably because the equatorial regions are dry, but higher latitudes are too wet for dunes.

Venus Express has discovered an infrared glow from nitric oxide in the night-time atmosphere of Venus, at an altitude of roughly 70 miles. The glow is not always detected, indicating the atmosphere is turbulent at this altitude, and only sometimes achieves densities sufficient to produce detectable glow. Though this chemical is present at Mars and the Earth, no such glow has been found on these other planets. Other previously seen molecules, such as oxygen and hydroxyl, are being monitored. The glows from the different molecules occur at different altitudes, and do not always happen at the same times. The same observations also found twice as much hydrogen in the upper atmosphere as had previously been believed there.

Pluto – Astronomers using the Very Large Telescope in Chile have measured the amount of methane in Pluto's atmosphere (1/2 % of the molecules) and have measured the lower atmosphere's temperature to be about 70° F warmer than the surface. The upper atmosphere was previously measured to be about 90° F warmer than the surface, so there is a temperature inversion (cooler at the surface). It has long been known that the atmosphere is mostly nitrogen, is quite thin (about 1/100,000 that of the Earth), and that the surface is about -360° F. When Pluto is closer to the Sun in its orbit, the surface warms and sublimates (evaporates), increasing the amount of atmosphere. The sublimation is what keeps the surface much colder than the adjacent atmosphere. The temperature difference would be even greater if the methane were not interfering with the process. Two different models match the data so far: a) there is a thin layer of methane at the surface, or b) there are patches of pure methane on the surface. Observation of changes as Pluto moves away from the Sun, or observations by the New Horizons spacecraft in a few years, should distinguish between these theories.

Swift (gamma-ray burst satellite) is spending its spare time, in between gamma-ray bursts, monitoring Comet Lulin with its ultraviolet and X-ray instruments. Swift is the only space telescope covering the part of the ultraviolet spectrum where hydroxyl lines lie, so is essential to determining the outgassing rate of the comet. Early results show 800 gallons of water per second being vaporized by

the comet. No comet before has been monitored simultaneously in ultraviolet and X-rays. Lulin passed only 38 million miles from Earth at the end of February.

Kepler (exoplanet search mission) launched March 6 into an orbit about the Sun that trails the Earth. It will stare at 100,000 stars in the Cygnus area for over 3 years to detect any planets that pass in front of any of those stars. It should be able to see an Earth-sized planet, so it is expected to find far more small planets than previous planet-search methods, which mostly find planets larger than Jupiter. The spacecraft has the largest camera ever launched into space, a 95-megapixel CCD array. Kepler will be able to measure the distances of planets from their stars, so will be able to tell if Earth-like planets lie in the habitable zone, that area where the temperature is right to allow liquid oceans. Checking out the spacecraft will take about 60 days, and then planet discoveries should start rolling in. The first planets will be ones close to their stars, since their periods will be short (a matter of days). Planets at distances from their stars comparable to Earth's will take years to discover. One of the most significant results to come from Kepler should be the probabilities that any star: a) has planets, b) has rocky Earth-like planets, and c) has planets in the habitable zone.

Galaxy formation – GALEX (ultraviolet space telescope) has found dwarf galaxies forming out of pristine gas leftover from the early universe. Galaxies found forming previously have been where concentrations of dark matter also exist, or formed from non-pristine gas (that with heavier elements added from former generations of stars). Though this newly observed type of galaxy formation has not been seen before, it is possible that it was common in the early history of the universe when most gas was pristine. The newly observed galaxies were found in the Leo Ring, a huge cloud of hydrogen and helium found in a ragged path around 2 massive galaxies in Leo. The Ring was found by radio astronomers more than 25 years ago, and cannot be seen in visible light. The new dwarf galaxies within the Ring have been seen only in ultraviolet light. Radio studies have previously shown that there is no significant amount of non-baryonic (not protons or neutrons) dark matter in the Ring. Such dark matter is found by its gravitational influence on ordinary (protons and neutrons) matter. Most galaxies have been found to form at concentrations of non-baryonic dark matter, while the few remaining galaxies form without the dark matter when tidal forces from interacting galaxies concentrate matter enough to form new dwarf galaxies. These tidal dwarf galaxies form out of gas about the interacting galaxies that has been enriched in heavier elements. Thus the newly discovered galaxies without enriched gas and without dark matter are unique.

Star formation – The submillimeter array, which sees light between radio and infrared, was used to study 2 dusty regions about 15,000 light-years away in the constellation Serpens Cauda, believed to be forming stars. It was found that one region had formed stars, and the other had not yet. This allowed the earliest view yet into the star forming process. There were 2 theories on what allows star forming clouds to avoid fragmentation, and therefore form very large stars: a) heat from protostars that have just formed, or b) turbulence in the gas cloud. The new observations found turbulence was more effective in avoiding fragmentation.

Dust formation – A team of astronomers has found that large amounts of dust are being produced within the dead remains of the Cassiopeia A supernova remnant. A supernova about 300 years ago formed this remnant. The origin of the dust remains a mystery. Some theories for its creation include condensing like snowflakes in the winds of red giant stars, or being produced in supernova events. A recent study using the polarimeter on the Maxwell Telescope in Hawaii showed that the light from the dust is polarized, indicating that the dust is aligning itself with a magnetic field. In fact the polarization was the strongest ever found within the Milky Way. It is not yet clear whether this is due to uniqueness in the grains themselves or unique conditions in the supernova remnant.

Supernovas near the Earth theoretically should give off gamma rays that produce more nitrogen oxide in our atmosphere. Now that excess has been found in ice cores from Antarctica at depths that correspond to the known supernovas in the years 1006 and 1054. A 3rd excess was also found, apparently due to a 3rd supernova that century, which went unreported. Possibly it was too far south to be seen by astronomers. Also small variations in nitrogen oxide were found with about a 10-year period, which may reflect the sunspot cycle, which averages 11 years. Also found were excesses of sulfates that corresponded to known volcanic eruptions, such as the New Zealand one in the year 180 and the Mexican one in 1260.

Hubble Space Telescope (HST) has discovered in the Perseus galaxy cluster a large number of small galaxies that have remained intact while larger galaxies around them are being ripped apart by the gravitational tug of other galaxies. The small galaxies showed no evidence of gravitational disturbance. They are old galaxies that have been around long enough to have suffered the same disturbing influences as the surrounding larger galaxies. The conclusion reached was that the small galaxies must lie within strong concentrations of dark matter, which hold them together despite disturbances. 29 small (dwarf) galaxies were studied, including 17 that were newly discovered. The Perseus galaxy cluster is 250 million light-years away.

Astronomers looked at archived HST images to find a recently discovered **exoplanet** in old images. They developed a computer technique to remove the glare around stars, and this revealed the planet. They estimate that using the glare-removal technique on all archived HST near-infrared images of nearby young stars should reveal about 100 planets, many of them not previously discovered.

Spitzer (infrared space telescope) has found carbon-rich material around stars near the center of our Milky Way galaxy. Previously no evidence for carbon-rich stars had been found near the center of the galaxy, though they exist other places. The discovery came during a study of 26 planetary nebulas near the galaxy center. Infrared spectra showed the carbon compounds. Both silicates (sand-like material) and hydrocarbons (molecules with hydrogen and carbon) were found, an unusual combination, usually found only around binary star systems. The astronomers theorized that at the end of their lives, stars rich in carbon in their interiors churn up the carbon and throw off the hydrocarbons into the existing silicate dust.

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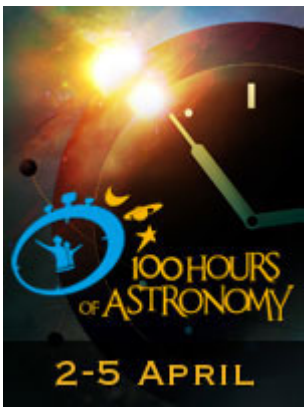
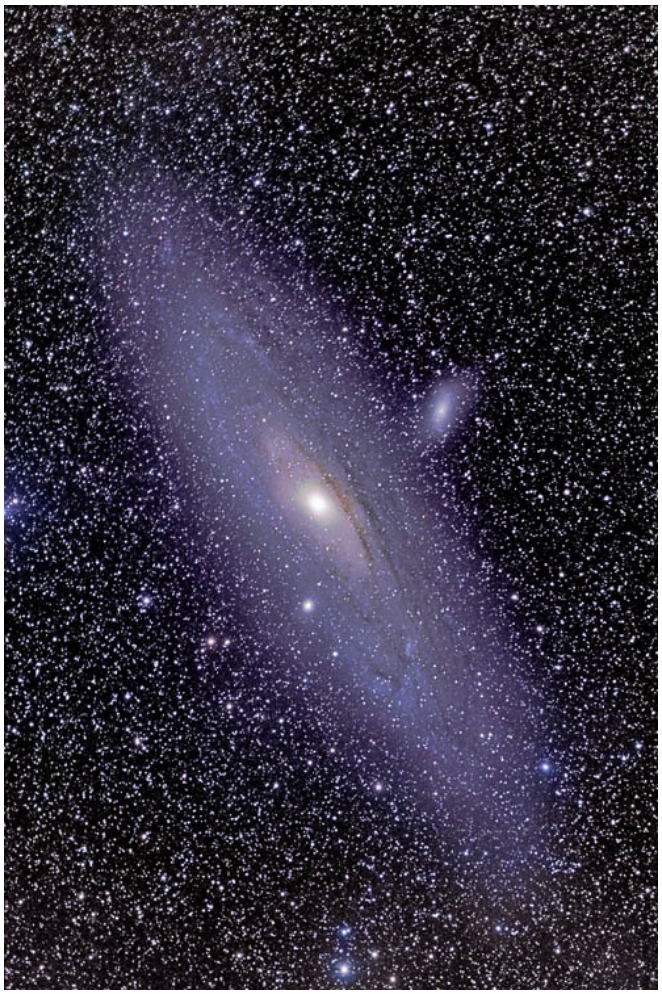
Activities of Orange County Astronomers for "100 Hours of Astronomy"

Reza AmirArjomand

Thursday, 4/2/2009
Public Outreach - O'Neill Regional Park
Friday, 4/3/2009
Public Outreach - Mission Viejo Library
Public Outreach - UCI Observatory
Private Outreach - Jordan Intermediate School
Saturday, 4/4/09
Public Outreach - Mission Viejo Library
Public Outreach - UCI Observatory
Public Outreach - Irvine Spectrum
Private Outreach - Inyokern
Sunday, 4/5/2009
Public Outreach - UCI Observatory





Always a crowd-pleaser, M31 was imaged by Don Lynn with an Internet telescope (FSQ 106mm refractor w/ SBIG STL 11000 imager) located in New Mexico. Generated from images take over two separate nights (9/3/08 and 9/6/08), the image seen here represents 14.5 minutes of total exposure.

NASA's Space Place

Apollo Upgrade

The flight computer onboard the Lunar Excursion Module, which landed on the Moon during the Apollo program, had a whopping 4 kilobytes of RAM and a 74-kilobyte "hard drive." In places, the craft's outer skin was as thin as two sheets of aluminum foil.

It worked well enough for Apollo. Back then, astronauts needed to stay on the Moon for only a few days at a time. But when NASA once again sends people to the Moon starting around 2020, the plan will be much more ambitious—and the hardware is going to need a major upgrade.

"Doing all the things we want to do using systems from Apollo would be very risky and perhaps not even possible," says Frank Peri, director of NASA's Exploration Technology Development Program.

The Chariot Lunar Truck is one idea for a vehicle equal to the lunar terrain. Each of the six wheels pivot in any direction, and two turrets allow the astronauts to rotate 360°.

So the program is designing new, more capable hardware and software to meet the demands of NASA's plan to return humans to the moon. Instead of staying for just a few days, astronauts will be living on the Moon's surface for months on end. Protecting astronauts from harsh radiation at the Moon's surface for such a long time will require much better radiation shielding than just a few layers of foil. And rather than relying on food and water brought from Earth and jettisoning urine and other wastes, new life support systems will be needed that can recycle as much water as possible, scrub carbon dioxide from the air without depending on disposable filters, and perhaps grow a steady supply of food—far more than Apollo life-support systems could handle.

Next-generation lunar explorers will perform a much wider variety of scientific research, so they'll need vehicles that can carry them farther across the lunar surface. ETDP is building a new lunar rover that outclasses the Apollo-era moon buggy by carrying two astronauts in a pressurized cabin. "This vehicle is like our SUV for the Moon," Peri says.

The Exploration Technology Development Program is also designing robots to help astronauts maintain their lunar outpost and perform science reconnaissance. Making the robots smart enough to take simple verbal orders from the astronauts and carry out their tasks semi-autonomously requires vastly more powerful computer brains than those on Apollo; four kilobytes of RAM just won't cut it.

The list goes on: New rockets to carry a larger lunar lander, spacesuits that can cope with abrasive moon dust, techniques for converting lunar soil into building materials or breathable oxygen. NASA's ambitions for the Moon have been upgraded. By tapping into 21st century technology, this program will ensure that astronauts have the tools they need to turn those ambitions into reality.

Learn more about the Exploration Technology Development Program at www.nasa.gov/directorates/esmd/aboutesmd/acd/technology_ dev.html. Kids can build their own Moon habitat at spaceplace.nasa.gov/en/kids/exploration/habitat.

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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Chandra (X-ray space telescope) has found the oldest isolated pulsar ever seen in X-rays. At 200 million years age, it is about 10 times older than the previous record holder. It is 770 light-years away, one of the nearest pulsars known. Older pulsars tend to be less active and are harder to observe in X-rays. Astronomers believe that it is brighter in X-rays than expected for an old pulsar because it is somehow converting energy lost from spinning slower into one of the processes that produce X-rays. It is spinning a little faster than once per second, which is slow for a pulsar.

Dusty universe – A study of the colors of distant quasars whose light passes near foreground galaxies on its way to Earth has revealed that intergalactic space is dustier than previously believed. Dust absorbs blue light more than red, so affects the color of light. The study was made with archived data from the Sloan Digital Sky Survey. Light from 100,000 quasars was studied, averaging colors to be able to see an effect that was too small to see in any one quasar. Dust was known to be common near galaxies, due to dying stars throwing out dust. But dust was found even hundreds of thousands of light-years away from galaxies.

Fermi (gamma-ray space telescope) has observed a gamma-ray burst (GRB) that appeared to have the energy of 9000 supernovas. This appearance may be misleading, since it is believed that bursts involve jets of material thrown out, and the burst appears far brighter if a jet happens to be pointed exactly toward us. It was the largest total energy, the fastest motions and the highest energy in initial emissions ever seen in a GRB. A spectrum of the burst afterglow taken with the 2.2-meter telescope in Chile revealed that the burst was so distant that its light took 12.2 billion years to reach us. A curious time delay was found between the highest energy emissions and the lowest. Such a lag has only been seen once before. One theory explaining the lag is that high and low energy gamma rays are emitted in different parts of the burst. Another theory is that quantum effects during the travel to us spread out the high and low energies. Attempts will be made to observe more bursts with lags in order to distinguish which theory is correct. Bursts farther away would correlate with longer quantum-effect delays, but the other theory would not.

A **map** of the entire sky **in gamma rays** has been constructed using the first 3 months of data from Fermi. The data were processed to remove gamma-ray emissions from the gas in the plane of our Milky Way galaxy in order to better show all other sources. A paper was published listing the 205 brightest sources of gamma rays in the new map. A full catalog will be released later this year using more data. Sources seen include the Sun, X-ray binary stars, pulsars, an intense radio galaxy (NGC 1275), a globular cluster (47 Tucanae), blazars, quasars, and quite a few objects where nothing exists at any other wavelength of light.

Binary black holes are thought to be common, but they have evaded discovery until now. A difficulty has been in proving that black holes that appear near each other are in fact orbiting. A pair of supermassive black holes has been found orbiting each other, separated by about 1/3 light-year, taking about a century to complete an orbit. Their masses are 20 million and a billion times the mass of the Sun. They were found by searching through data from the Sloan Digital Sky Survey for quasars, which are the light from material falling into the supermassive black holes at the centers of galaxies. It is thought that binary supermassive black holes form when galaxies collide, so that the black holes from each colliding galaxy orbit each other for awhile, and eventually merge.

Single top quarks – Scientists using the Tevatron particle collider at the Fermilab in Illinois have observed single top quarks (a few hundred of them) being produced in reactions involving the weak nuclear force for the first time. All previously seen top quarks, since their discovery in 1995, have been produced by strong nuclear force reactions, which produce pairs of top quarks rather than singles. Only 1 in every 20 billion collisions of a proton with an antiproton produces a single top quark, and other processes resemble the top quark production and must be sorted out. This has kept these from being observed before.

W boson (particle carrying the weak nuclear force) had its mass measured more precisely than ever before by a team of scientists using the Tevatron in Illinois. It's 80.401 ± 0.044, in case you needed the number. The mass calculation was the result of analyzing years of data regarding the decay of W bosons into electrons and neutrinos within the Tevatron. Scientists believe that they can calculate the mass of the theoretical Higgs particle from the mass of the W Boson. This new more precise result limits the possible mass range over which scientists must search for the Higgs particle. Finding the Higgs particle will tie together much theory regarding subatomic particles.

Instant AstroSpace Updates

Some scientists have estimated that the chances are about 50% that the delay in operating the Large Hadron Collider in Switzerland (due to electrical failures in the magnets when started up last year) will allow the older Tevatron in Illinois to find the **Higgs particle**, long theorized, but not yet found.

A new paper claims that some of the patterns found in the asteroid belt are leftover from the time that planets were forming and migrating to their present orbits, lending support to the theory that much **migration of orbits** occurred back then. Other patterns have long been known to result from gravitational disturbances of Jupiter in its current orbit.

The Space Shuttle Discovery launched March 15 on a mission to add the 4th and final large solar array to the **International Space Station**, providing enough power for a station crew of 6 (was 3), and making the station the brightest object in the night sky other than the Moon (the station is surpassing Venus in brightness). The acre of solar panels will produce 84-120 kilowatts, depending on season and Sun angle.

(continued next page)

(continued from page 3)

This Five-Year Anniversary document continues with an account of what happened with the club in the first few years after the meeting in Chuck's garage:

> Since the garage the club has had many meeting places: several members' homes, several schools, one bank basement, a community college lecture room, and currently the Santa Ana Library's Spurgeon Room. The membership has gown quite a bit since then also – the original 26 charter members have increased the ranks to some 115 at present, not counting the members who have come and gone in between.
>
> OCAAA has been a busy and ambitious group in the past five years. In August 1970, Alan Wardell started the newsletter with issue number 1. In July 1971 the Observatory Project was started although it had been discussed for quite some time previous to that. On February 28, 1972, OCAAA became a California Corporation. The club has been able to offer members guest speakers, field trips, conventions on astronomy, but best of all has been an opportunity for the exchange of information and ideas in astronomy among the members. Happy Anniversary, OCAAA, and thanks to everyone who has given their time and energy to keep it running!

2007 marked our 40th anniversary as a club, based on the 1967 formal start date – and we're still running strong, thanks to the efforts of many different members over the years. I'd like to echo the sentiments expressed in 1972, and give thanks to everyone who has given their time and energy over the life of our club and its predecessors to keep it running and keep the interest in astronomy high in Orange County!

The **STEREO** pair of spacecraft studying the Sun are in orbits about the Sun, one drifting ahead of the Earth, the other behind. They will pass through the L_4 and L_5 Lagrangian zones soon, where combined gravity of the Sun and Earth stabilize orbits, and are being directed to search the areas for possible asteroids lurking there. ■

Cassini (Saturn mission) successfully swapped to its backup set of 8 thrusters, as commanded by spacecraft controllers because the original thrusters are showing degradation from 11 years of use.

Mars Odyssey (orbiter) successfully shut down and restarted, as commanded by spacecraft controllers to clear some memory glitches that had accumulated over the years. The restart also erased a problem with using the B-side (backup set of systems) on the spacecraft, so the backup system is available again if needed.

Mars Reconnaissance Orbiter has recovered from an unexpected computer reset in late February and resumed studying the red planet. It is believed a cosmic ray hitting the spacecraft computer caused the problem.

The **Orbiting Carbon Observatory**, which was to settle the controversies over what the sources of carbon dioxide are and where it is disappearing and in what amounts, failed the "Orbiting" part. It crashed during launch, due to a failure in the removal of the launch cover.

Chang'e-1 (Chinese lunar orbiter) successfully concluded its mission March 1 by impacting the surface of the Moon. The 16-month mission mapped the lunar surface in 3 dimensions.

NASA and the European Space Agency (ESA) have agreed on priorities for **future planetary missions**, and one to orbit Jupiter's moon Europa and the other Galilean moons is first priority (to launch in 2020), and one to Saturn's moons Titan and Enceladus is to follow.

NASA has awarded a contract to study how **Mars** could be **explored by balloons** launched from a lander. Balloons could sample atmosphere at all altitudes, travel farther than a rover, and get better resolution surface images than orbiters.

Russia and the US-based Planetary Society have agreed to **send life** (bacteria, spores, seeds, crustaceans, insects and fungi) **to Phobos** (a moon of Mars) and back to see how it reacts to long-term space travel. In a previous similar experiment, a mosquito that goes into suspended animation during droughts survived 18 months outside the International Space Station.

Herschel (3.5-meter far infrared and submillimeter space telescope) and **Planck** (cosmic microwave background space telescope), scheduled for launch on a single Ariane rocket, have been delayed at least until the end of April due to ground operation software not being ready.

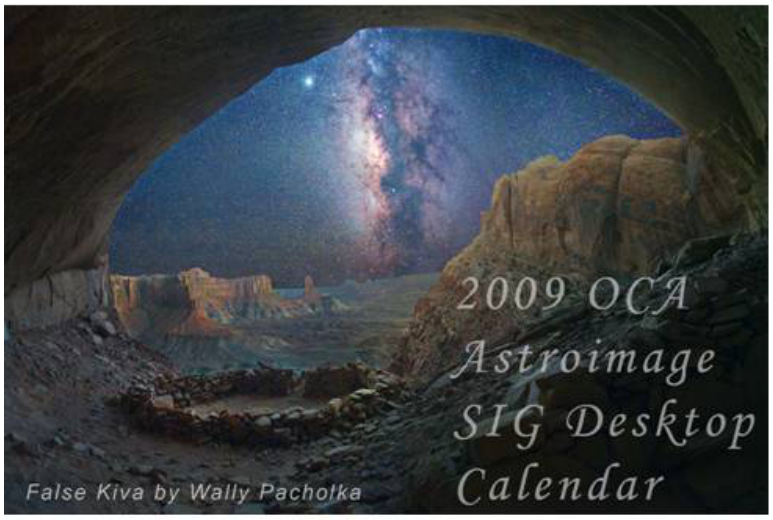
The next Automated Transfer Vehicle (ATV) to be sent to the International Space Station has been named **Kepler** after the 17th century astronomer (not to be confused with the Kepler planet-finding mission). The previous ATV was named Jules Verne.

Swift (gamma-ray burst satellite) managed to take an ultraviolet spectrum of a gamma-ray burst just 251 seconds after the burst began, the earliest such spectrum ever captured. The spectrum yielded a distance of 8 billion light-years and revealed the density of hydrogen clouds in the galaxy hosting the burst.

Astronomers using 2 of the Very Large Telescopes in Chile combined as a near-infrared-light **interferometer** have imaged the double star Theta1 Orionis C and a star with a shell around it, T Leporis, reaching resolutions of 0.004 arc seconds. ■

Lunar Orbiter 1 captured this first-ever Earthrise photo from lunar orbit in 1966. The 2-inch analog tapes containing the Lunar Orbiter images languished in storage for decades before being transferred to modern format by the Lunar Orbiter Image Recovery Project. Using an AMPEX FR 900 analog recorder rebuilt from parts of four surviving recorders, and working from an abandonned McDonald's near the NASA Ames Research Center, the project hopes to recover all the analog data from the Lunar Orbiter series of missions for use as a baseline against which to compare images from the upcoming Lunar Reconaissance Orbiter mission. By comparing the two series of images, lunar scientists hope to detect changes on the lunar surface that may have occurred in the interim. This is the first time in over 40 years that this particular image has been seen with such high resolution. (credit: NASA/LOIRP)

2009 OCA Astroimage SIG Desktop Calendar - Now Available!



With Images by John Sanford, Ray Stann, Larry Gershon, John Castillo, Craig Bobchin, Bruce Waddington, Pat Stoker, Don Lynn, Gary Schones, Dave Snope, Jim Windlinger, Dave Kodama, Bill Patterson, Alan Smallbone and Wally Pacholka!

15 **months** of images by OCA members to enjoy!

ONLY $10!!!

See Charlie Oostdyk at the general meetings, or contact Barbara Toy or Alan Smallbone for information about ordering and picking up at other OCA meetings! Great Gift Idea!

The pair of colliding galaxies known as NGC2207 was imaged using OCA's Kuhn telescope on January 31, 2009. Pat Knoll noted that the skies were unstable for Kuhn's focal length when this image was created.

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