SIRIUS ASTRONOMER

www.ocastronomers.org

The Newsletter of the Orange County Astronomers

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SEPTEMBER MEETING MOVED UP TO SEPTEMBER 7TH! MARK YOUR CALENDAR!

OCA's Pat Knoll has been testing a prototype autoguiding interface with the club's 22-inch Kuhn telescope. This image of M20 was captured on August 4th using the new system. The observatory renovations are anticipated to be complete by the end of October. Many thanks to Dave Radosevich and all who've volunteered for this project.

OCA CLUB MEETING

The free and open club meeting will be held Friday, September 7th at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. The scheduled speakers are Gernot Meiser and Pascale Demy, discussing their eclipse chasing activities across Africa!

Next General Meeting: October 12th

STAR PARTIES

The Anza site will be open this month on August 8th. The Black Star Canyon site will be open this month on September 1st. 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 14th (and next month on October 5th) at the Centennial Heritage Museum at 3101 West Harvard Street in Santa Ana.
GOTO SIG: TBA (contact coordinator for details)
Astrophysics SIG: Sep. 21st, Oct. 19th
Astro-Imagers SIG: Sep. 18th, Oct. 16th
EOA SIG: Sep. 26th, Oct. 24th
Dark Sky SIG: TBA (contact coordinator for details)

President's Message

By Barbara Toy

Where did the summer go? Here it is, September already, with school starting, most vacations over... for people in our hobby, autumn is usually a great time, as the temperatures are still reasonably warm at night, and the nights themselves are longer than during summer, giving more time for viewing and imaging between the twilight after sunset and the twilight before dawn. If you stay up long enough, it's the time of year when you can see the winter constellations in comparative comfort. It's a good idea to take along warm clothes when you go out for a night of observing, though, just in case – it can get surprisingly chilly if you're not moving around, even though the days may be hot.

Those of you who decided not to come to the August star party at Anza because of the weather forecast missed a great night of observing. Even though the Clear Sky Clock predicted clouds and poor to mediocre seeing, what clouds there were during the day vanished by sunset and the night was clear, dark and steady. I'm told that other weather forecasts besides the Clear Sky Clock were pretty pessimistic about conditions that night, as well. It's all part of the mystique of our hobby – we never know if the weather will be much worse than forecast (we've all been skunked more than once!), if it will be better (which can never happen often enough), or if it will be exactly as forecast, which tends to catch everybody by surprise.

At any rate, though there were not quite as many people out at Anza for the star party as we might have expected, the Football Field was full, a lot of people made their way up to the Observatory, and everyone seemed to be having a good time and keeping an eye out for Perseids. Joe Busch and Dave Radosevich were out there the night before and reported that there were a lot of meteors, which seemed to be an early surge in the annual Perseid shower, so we all hoped for an even better show that Saturday. There were more meteors than usual, but most of the brighter ones I saw seemed to be sporatics, not radiating from Perseus, and those that clearly *were* Perseids were pretty dim – the show on Friday apparently was much better. Jim Windlinger stayed out at Anza for the main shower on Sunday night/early Monday morning, and captured a nice shot of a Perseid passing the California nebula on its way to the Pleiades (you can see it in the club's Image Album at http://www.ocastronomers.org/astroimages/album.asp?ID=5453, and also check out the Perseid caught by another member, Wally Pacholka, streaking past Taurus over Half Dome in Yosemite http://www.ocastronomers.org/astroimages/album.asp?ID=5462).

Need Help in October With the Observatory Roof

If you've seen the club observatory during daylight hours, you may have noticed all the work that Dave Radosevich, Jim Hannum, John Kerns and the various people who have been helping them have done in preparation for the actual replacement of the existing roll-off roof with a metal roof; this includes replacement of the support wall to the north of the observatory with a steel frame, replacement of the rails the roof rolls on and the supports below them, and replacement of the roofing material on the permanent roof over the warming room and bathroom. They've been building the components for the new roof in the shed on their property, so there's a lot of work that's been done beyond what you can see around the observatory itself.

Well, the time for the actual change-out is approaching fast. Dave and company are planning this for October, but the precise period for the work has not been set as of this writing. When the work gets underway, we will need help, as we really need to have two crews working, one on the new roof and the other removing the old one. Dave has told us that, once the work gets started, they can't safely stop until at least the new roof is completed, which is expected to take several days. Ideally we'll have enough workers to deal with both parts of the project at the same time, so the observatory can be put back in operation with a minimum of down time. If that doesn't work out, the new roof can be assembled over the observing area so it remains covered, but we wouldn't be able to open it until the old roof is removed.

While we welcome anyone with construction skills, that isn't really necessary for the work that we need done here – per Dave, what we need is a lot of unskilled labor. So, whether you have specific skills you think would help or not, we can use your help!

You don't need to commit to being at Anza for the full period the work is going on – if you can only work on this one or two days, that would be very helpful. I'm trying to get an idea of who can commit what time to this part of the project, so if you can help out, please email me what days of the week you might be available and how many days you think you could work on this (btoy@cox.net). We expect that it will take several weekdays as well as weekends to get it finished, so any weekdays you could help out with would be particularly helpful.

It's exciting to finally be at the point where the new roof is going up on one of the club's biggest assets – do come and be a part of this great project!

Casinos and Other Dark Sky Matters

One of our concerns as astronomers is protecting our ability to see the night sky – which, of course, also protects that ability for others. When Chris Butler jokes about how few things he can see things from Buena Park because of the light polluted skies, he makes it funny but it's also sad, as most people in Orange County (and the other urban areas of Southern California) live under skies that are equally blotted out because of waste light. One of the most valuable services our club provides is access to dark sky sites where people can view in reasonable safety and (at least at Anza) in reasonable comfort.

With all of the development going on in Riverside and north San Diego Counties, the condition of the skies near our Anza site is definitely deteriorating. One major consideration when the location of our Anza site was chosen was that it was within the Palomar Protected Zone, which is protected by ordinances adopted by both Riverside and San Diego Counties to help protect dark skies for Palomar Observatory. Unfortunately, enforcement of the ordinances is spotty, at best, partly because of lack of personnel and partly because the people responsible for enforcement need to be educated about the importance of maintaining these standards. One of our members who lives not far from our Anza site told me recently that an inspector in Riverside County told him that the ordinance was no longer needed because Palomar was no longer in operation – he did a bit of educating on the spot, but we suspect this person was not alone in this mistaken belief.

Why bring this up now? First to let you know that there are established standards for outside lighting in the area of our Anza site, and (unfortunately) a number of people who have chosen to move to that area are not in compliance. We want to remain on reasonably good terms with our neighbors, so we don't want to be too heavy-handed about pushing enforcement, but we also need to do what we can to educate the people around us about the benefits of preserving the darkness of the night sky and, where necessary, push the authorities to enforce the lighting ordinances.

Another reason for bringing this up is that one of the local tribes, the Pauma tribe, is planning a major expansion of their casino and resort. There are already two very large casino/resort developments to the south/ south-west of our Anza site, Pachanga in Temecula and Pala on Highway 76, which is the main route to Palomar from the I-15. Pauma is further along the 76, in Pauma Valley. The Cahuilla casino is much closer, between our site and the town of Anza, but fortunately it's small and its location doesn't attract nearly as much traffic as these other casinos.

Scott Kardel of Palomar Observatory notified us that the Pauma tribe has now completed its draft Environmental Impact Report, which is now available for public comment. Among other things, the new casino will use a lot more lights for their enlarged parking area and throughout the complex, and Scott noted that their draft EIR did not mention use of low pressure sodium lights, which would be easier for astronomers to work with. These plans are a major concern for Palomar Observatory, which is only six miles away from the planned development. Palomar is already contending with increasing light pollution from the growth of nearby cities as well as major developments such as this one. Although the Pauma tribe claims that it will try to keep lights to a minimum and to focus lights on the ground or buildings rather than the sky, they have just installed searchlights at the existing casino that were raking the sky all night (Scott talked to them about this and convinced them to limit the searchlights to three hours a night, which is some improvement); this indicates that protecting the night sky isn't one of their priorities. We wouldn't be affected as much as Palomar, as Pauma is on the other side of the mountain from our Anza site, but this project as currently planned would add to the lightdome we see to the south of our Anza site.

You can find more information about this at http://www.astro.caltech.edu/palomar/casinos/pauma.html. Now is the time the public can have the greatest effect on this project, so please make your concerns known. The public meeting on the project will already have passed by the time you receive this issue of the Sirius Astronomer, but written comments on this proposed development can be submitted until Sept. 21 to Michael Baksh, Tierra Environmental Services, 9915 Businesspark Avenue, Suite C, San Diego, CA 92131. Scott has also been keeping our Dark Sky group informed about this; if you would like to join the email group, it is OCADarkSky@yahoogroups.com.

It's important protect the dark skies that help Palomar remain an important research center and that we need at Anza, and any help you can give will be very much appreciated.

A Couple of Great Upcoming Festivals

Starry Nights

Every year, the town of Yucca Valley near Joshua Tree National Park shuts off the street lights and a lot of other lights in town, making it amazingly dark for an urban area, for its Starry Nights Festival. This features speakers during the day and public viewing at night, with demonstrations, vendors and other events. A great time is generally had by all, particularly fans of David Levy, who is a regular speaker there. This year, the Starry Nights Festival will be held September 28 and 29 – it's a good event for the whole family, and you should really consider going if you've never given it a try before.

Nightfall

The folks that organize the RTMC Astronomy Expo are apparently gluttons for punishment, as they also organize the Nightfall festival at the Palm Canyon Resort at the edge of Borrego Springs in the early autumn each year. This is one of the most civilized regional star parties around, held on the grounds of the resort and close to comfortable rooms, a restaurant, general store and other resort amenities. Most folks who attend book a room at the resort (there are special rates for this event) or bring an RV and camp in the RV area. There are talks and other activities during the day, including activities for non-astronomers, and viewing and imaging at night under dark desert skies. This is a smaller and more intimate event than RTMC, with a lot less dust, and is a lot of fun for those who attend. The dates for Nightfall this year are October 11-14; for details see http://www.rtmcastronomyexpo.org/nightfall.htm.

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AstroSpace Update

September 2007
Gathered by Don Lynn from NASA and other sources

Io torus – It has long been known that there is a torus (doughnut shaped) cloud of sodium atoms about Io's orbit around Jupiter. It is certain that Io feeds this cloud as fast as it dissipates, but the exact mechanism of launching the atoms has yet to be determined. New very high resolution images of the cloud have been made by stacking numerous very short exposures made with a filter to select only sodium light. Only the best quality exposures are used in the stack. The new images show that there are 2 distinct sources of sodium atoms. One source is atoms sputtered off the surface when ions and electrons trapped in Jupiter's magnetic field collide with Io. The other source is within the wake of particles that have just streamed past Io, and appears to be due to chemical reactions of the particles. The sodium cloud varies over months and years. It is unlikely that the sputtering source varies much, so it is probably the second source that is varying. It probably varies in reaction to the level of volcanic activity on Io.

Chandra (orbiting X-ray observatory) – A study using Chandra comparing very distant galaxies with somewhat closer ones has found the more distant ones have more active galactic nuclei (AGNs). The amount of material falling into the central black hole of a galaxy determines how active its nucleus is. The light left the more distant galaxies in the study when the Universe was 58% of its current age, while the other group is seen as it was at 82% the current age. The observations show that during the interval between these time points, the Universe evolved such that less material was falling into galaxies' central black holes. Galaxies in clusters had 20 times more AGNs in the earlier sample, while galaxies outside clusters had only 2-3 times more AGNs. It is believed that gas available to fall into central black holes was substantially used up during the time interval.

Dark matter – There are 3 main components to galaxy clusters: individual galaxies composed of billions of stars, hot gas between the galaxies, and a halo of dark matter. The dark matter can be mapped by its gravitational effect on light from more distant galaxies passing through it. The individual galaxies are located in visible light. The hot gas is found by X-ray images. With one exception, the 3 components are always found centered on each other. The exception is a galaxy collision called the Bullet Cluster, in which the hot gas was slowed by the collision, and lags behind the dark matter and individual galaxies. The Chandra orbiting X-ray observatory and 2 telescopes in Hawaii have mapped galaxy cluster Abell 520, and found 2 things never seen before: 1) a halo of dark matter with hot gas, but essentially no galaxies, 2) a group of individual galaxies with no dark matter halo. Theorists are having a difficult time explaining how the dark matter and gas together could have separated from the individual galaxies. One possibility is that dark matter is affected by another force besides gravity, but it is difficult to see how that could be without having seen the evidence in other galaxy cluster collisions.

Spitzer (infrared space telescope) has found a dust disk about a double star that has gaps in it that might be caused by planets (other causes are possible). There is another double star distantly orbiting this double. This is possibly the first planetary system known that has 4 stars. The gaps are at distances from their double star that correspond to about Mars's and Jupiter's distances from the Sun. The second double star is somewhat farther from the disked double than Pluto is from our Sun. The system is only 10 million years old, and lies 150 light-years away in Hydra.

Spitzer has also found 4 large **galaxies colliding** with each other, which will eventually merge into a single galaxy up to 10 times the mass of our Milky Way (which is a fairly large galaxy). No collisions of more than 2 large galaxies have been previously seen, so this is by far the largest galaxy collision known. A plume of older stars has been strewn out from the collision. About half the stars in the plume are expected to later fall back into the merged galaxy. No new stars were seen in the collision, indicating that the colliding galaxies had already used up most of their original supply of gas. Collisions of gas-rich galaxies disturb the gas into collapsing into new star-forming regions.

Elliptical disk – Astronomers using the Hubble Space Telescope and the Keck Telescope in Hawaii have found an elliptical debris disk around a young star. Such disks are normally circular. The eccentricity may be caused by the gravity of planets in elliptical orbits, or by the gravity of a passing star. Further observations will be made to confirm or rule out the effects of nearby stars.

Mars rovers – Both rovers have been engulfed in dust storms for weeks now that substantially reduce the sunlight available to power the rovers through their solar panels. The worst days have seen over 99% of the sunlight blocked, though enough of this sunlight is scattered about the sky to allow about 1/6 the normal power to be generated. This is so low that the normal response to low power, that of stopping all driving and use of cameras and spectrographs, was not enough. So for the first time in the 3-year exploration, spacecraft controllers commanded one rover to skip radio contact with Earth on some days to further reduce power needs. The rovers cannot be entirely turned off to save power, since turning off internal heaters would result in damage to instruments and control electronics. After the internal temperature came with 3 degrees (minus 35 F.) of triggering the emergency heater, the density of the dust clouds began to drop, and energy generated rose. A small amount of science observations was resumed daily in mid-August. Opportunity's internal temperature rose to minus 28 degrees as a result of increased use of the internal electronics. Both rovers were able to recharge their batteries. However, power levels are not yet high enough to resume full communications to Earth. As of this writing, Opportunity's skies had not cleared enough to restart the plan to drive down into Victoria Crater.

Cassini (Saturn mission) has imaged a previously unknown moon about Saturn, bringing the total number of known moons to 60. When Cassini was launched from Earth, Saturn was known to have only 18 moons. Cassini has found 5, and Earth-based observations

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Cosmic Cockroaches

By Dr. Tony Phillips

Using the IR spectrometer on the Spitzer Space Telescope, scientists found organic molecules in supernova remnant N132D.

Cockroaches are supposed to be tough, able to survive anything from a good stomping to a nuclear blast. But roaches are wimps compared to a little molecule that has recently caught the eye of biologists and astronomers—the polycyclic aromatic hydrocarbon.

Polycyclic aromatic hydrocarbons (PAHs for short) are ring-shaped molecules made of carbon and hydrogen. "They're all around us," says Achim Tappe of the Harvard Center for Astrophysics. "PAHs are present in mineral oils, coal, tar, tobacco smoke and automobile exhaust." Aromatic, ring-shaped molecules structurally akin to PAHs are found in DNA itself!

That's why Tappe's recent discovery may be so important. "PAHs are so tough, they can survive a supernova."

The story begins a few thousand years ago when a massive star in the Large Magellanic Cloud exploded, blasting nearby star systems and interstellar clouds with hot gas and deadly radiation. The expanding shell, still visible from Earth after all these years and catalogued by astronomers as "N132D," spans 80 light years and has swept up some 600 Suns worth of mass.

Last year "we observed N132D using NASA's Spitzer Space Telescope," says Tappe. Spitzer is an infrared (IR) telescope, and it has a spectrometer onboard sensitive to the IR emissions of PAHs. One look at N132D revealed "PAHs all around the supernova's expanding shell. They appear to be swept up by a shock wave of 8 million degree gas. This is causing some damage to the molecules, but many of the PAHs are surviving."

Astronomers have long known that PAHs are abundant not only on Earth but throughout the cosmos—they've been found in comet dust, meteorites and many cold interstellar clouds—but who knew they were so tough? "This is our first evidence that PAHs can withstand a supernova blast," he says.

Their ability to survive may be key to life on Earth. Many astronomers are convinced that a supernova exploded in our corner of the galaxy 4-to-5 billion years ago just as the solar system was coalescing from primitive interstellar gas. In one scenario of life's origins, PAHs survived and made their way to our planet. It turns out that stacks of PAHs can form in water—think, primordial seas—and provide a scaffold for nucleic acids with architectural properties akin to RNA and DNA. PAHs may be just tough enough for genesis.

Cockroaches, eat your hearts out.

Find out about other Spitzer discoveries at www.spitzer.caltech.edu.

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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have discovered 37 since then. Moon number 60, nicknamed Frank by its discoverers, is about 1.2 miles across and is made mostly of ice and rock. It orbits between the orbits of moons Methone and Pallene. The planned orbit of Cassini will bring it near the moon in December of 2009, when good images of it will be attempted.

The source of the material in Saturn's **G ring** has been found. On the inner edge of the ring, there is a bright arc, which has been found from new observations to be composed of larger icy particles, ranging in size from peas to small boulders. The actual particles have not been seen, but are implied by charged particle measurements. More evidence for the particles should become available when Cassini's orbit takes it near the ring 18 months from now. The arc is maintained by a resonance with the moon Mimas. The arc extends about 1/6 of the way around the planet, and is only 155 miles wide (as compared to the entire G ring of 3700 miles wide). It was first noticed in 2004. The only other place in the solar system with such ring arcs is at Neptune. When micrometeoroids collide with the particles in the Saturnian arc, they create a continuous source of dust. The dust is slowly dissipated outward by the action of Saturn's rotating magnetic field. This slowly dissipating dust ring is the G ring. It now joins the E and F rings as ones with known causes (Enceladus spewing geyser material and moons Pan and Pandora gravitationally herding particles, respectively).

Iapetus (Saturnian moon) has been known for 2 years to have an elliptical shape, bulging somewhat about its equator, and further has a mountain range sitting atop the bulge. These features have defied explanation until now. The surface of Iapetus apparently froze at a time very early in its history (first few hundred million years) when it was rotating fairly rapidly. Centrifugal force of the spin caused the shape to bulge around the equator. Slowing of the rotation after the surface froze allowed its gravity to try to pull it into a more spherical shape, which caused excess surface material to wrinkle into the mountain range now seen. Iapetus rotates once every 80 Earth days now, but it had to have been rotating once every 5 to 16 hours during its freezing in order to attain its current shape. The other moons of our solar system are thought to have frozen to their final shape much later in their history, so Iapetus may be the only relic of this early period. Computer simulations of the formation of Iapetus show that the immediately previous melting had to have been caused by radioactive heating from isotopes that decay quickly, such as aluminum-26 and iron-60, allowing the freezing to occur early. Scientists then used aluminum-26 to date the formation of Iapetus, and calculated its age as 4.564 billion years. More discoveries about Iapetus may be made when Cassini makes a close encounter on September 10.

Charon – High resolution infrared spectra of Pluto's moon Charon using adaptive optics on the Gemini 8-meter Telescope in Hawaii show that the surface is covered with water ice crystals and ammonia hydrates. This suggests that liquid water mixed with ammonia is pushing out from within, possibly as geysers. Other sources for ice crystals, such as primordial ice, meteorite gardening and convection, have been ruled out by the new observations. Ammonia lowers the melting point of water enough that a moderate heat source, such as radioactivity, could melt water internally even considering how cold Charon is. Geyser activity could be verified when the New Horizons spacecraft visits the Pluto system in 2015. Similar spectra will be taken of Kuiper Belt objects other than Charon, such as Quaoar and Orcus, to look for evidence of geyser activity there.

XMM-Newton and Chandra (orbiting X-ray telescopes) have discovered that galaxy cluster Abell 576 is actually two separate clusters colliding. The matter emitting X-rays has two distinct velocities, one being over 2000 miles per second different than the other. The temperature of the matter is too low for any other explanation that would impart such a large difference in velocity to part of the cluster. The collision is being seen almost head on. A number of other galaxy clusters are being examined to see if they are also colliding pairs.

New AGN class – A team of astronomers using the Swift satellite and the Japanese Suzaku X-ray space observatory have discovered a new class of active galactic nuclei (AGN). Known classes of AGN include quasars, blazars, Seyfert galaxies and more. The new class cannot be seen except in high-energy X-rays, due to being surrounded by very thick gas and dust. Previously known obscured AGN were visible to very sensitive telescopes in much of the spectrum because they were obscured by a torus, which allowed light to escape through the donut hole, and then reflect off material to be seen dimly. The new class seems to be obscured in all directions. Only high-energy X-rays have the power to punch through. Swift found many AGN that had not been found by previous surveys in less energetic wavelengths of light, so the new class may be quite common. As many as 20% of the X-ray point sources may be these new objects.

Black holes – The Hubble Space Telescope and telescopes in Hawaii have been used to analyze the material falling into black holes at the centers of galaxies. The gas was found to be almost pure hydrogen and helium, even though the other material in the galaxies was rich in heavier elements, such as carbon and oxygen. This implies the gas falling into the black hole came from another galaxy, most likely one that collided with it. Patches of the pure gas were found scattered around the galaxy, so the central black hole does not capture all of the material from a colliding galaxy, but scatters much of it.

Extremely bright galaxies – Combining the capabilities of several types of telescopes, astronomers have spotted extremely bright galaxies. They were first seen in images taken with submillimeter telescopes, which see light between infrared and radio. Follow up observations with a submillimeter array, the Hubble Space Telescope, Spitzer infrared space telescope, and the Very Large Array of radiotelescopes has determined that 7 of the galaxies are so distant that light took over 12 billion years to reach us. The brilliance is a result of star formation at a rate about 1000 times that of our Milky Way. But much of the light is hidden in visible wavelengths by dust, though infrared and radio light penetrate the dust. Theorists are having difficulty explaining how such large and bright galaxies could have formed this early in the history of the Universe.

Type Ia Supernova – The 8-meter Very Large Telescope in Chile and the 10-meter Keck in Hawaii have taken the most detailed spectra yet of the material surrounding a Type Ia supernova, which was seen 2 years ago in galaxy M100. Supporting data also came from a radiotelescope and the Hubble Space Telescope. It has long been known that a Type Ia occurs when material from

a closely orbiting companion star falls onto a white dwarf star in sufficient quantity to push its mass over the limit of what a star can stably support, and an explosion occurs. The new observations showed exactly what kind of material had been falling onto the white dwarf, and it appears to be shells of gas blown off by a red giant star in puffs every 50 years or so. Red giant stars are known to have periods of very strong stellar winds that blow such material away. The question of whether this is typical for Type Ia will be answered by similar observations of other supernovas.

Supergiant star molecules – A sensitive radiotelescope has found a score of unexpected molecules about the supergiant variable star VY Canis Majoris. The star is one of the most luminous infrared objects in the sky, giving off a half million times the energy of our Sun, but mostly in infrared, due to its cooler temperature than the Sun's. It is 25 times the mass of the Sun, but is losing mass (astronomically) quickly, since it is blowing away about 1 millionth of its mass every year. The newly found molecules include table salt, phosphorus nitride, hydrogen cyanide, and an ionized molecule HCO+. The material is rich in carbon and especially oxygen. It was not only emitted spherically about the star, but also in 2 asymmetric jets. The jets are believed to be caused by super granules, huge bubbles of material that rise to the surface of the star, then blast into space. The new findings will require revision of theories on how the heavier materials (heavier than helium) that make up planetary systems came to be distributed about galaxies.

GALEX (ultraviolet space telescope) has spotted a surprising comet-like tail behind the star Mira, first seen during GALEX's survey of the entire sky in ultraviolet. Mira is a fast moving older red giant that is shedding massive amounts of surface material. Nothing like this tail has ever been seen before around a star. It has apparently avoided discovery by shining only in ultraviolet light. Astronomers expressed surprise at finding a major feature of a star that has been studied for 400 years. The tail material consists of carbon, oxygen and other elements, and has been cast off within the past 30,000 years. Compared to other red giants, Mira is traveling unusually fast, at 291,000 mph. GALEX also found a bow shock, a buildup of hot gas in front of Mira, and 2 sinuous streams of material emanating from the front and back of the star. The bow shock is believed to be heating the tail material, causing it to fluoresce in ultraviolet.

Red giant planet – A planet has been found orbiting a red giant star by a team led by Alex Wolszczan, the astronomer who found the first exoplanet ever, in 1991, orbiting a pulsar. It was the first planet discovery made using the Hobby-Eberly 9-meter telescope. The star has 2 times the mass of our Sun and 10 times the diameter. The team has been searching for planets orbiting red giant stars, using the usual redshift method. Other astronomers using the method have concentrated on Sun-like stars rather than red giants. Only 10 such planets are known, while nearly 300 planets are known orbiting Sun-like stars. The team has been collecting data on nearly 1000 red giants for 3 years, and now has enough that planet discoveries are expected to come quickly now. One goal of the project is to see if a star swelling to a red giant affects the orbits of its planets, causing orbit crossings and collisions, as theoretically should happen. Another goal is to see if planets occur in the habitable zone (right temperature for life) around red giants, which should be much larger than the habitable zone for Sun-like stars. The newly discovered planet orbits in 360 days and is located about 300 light-years away.

Largest exoplanet – A team of astronomers searching for planets that pass in front of (transit) their stars, using very small automated telescopes watching thousands of stars, has found the largest known planet. It is 1.7 times the diameter of Jupiter, but less massive, making it also the least dense planet known, about the average density of balsa wood. The search project is called TrES, so the planet is being called TrES-4, being the 4th discovery of the search. TrES-4 is about 1400 light-years away, orbits its star every 3.5 Earth days, is about 4.5 million miles from its star (quite close), and is heated by its star to about 2300 degree F. The planet is larger than current theory can explain. It was discovered by a 4-inch telescope, and confirmed with the 400-inch (10-meter) Keck Telescope. The host star is a subgiant, a stage on the way to becoming a red giant.

Phoenix (Mars lander) blasted off August 4 atop a Delta II rocket, aiming for touchdown in the north polar area of Mars next May 25, where it will dig soil and ice and analyze it, as well as monitoring polar weather. The entire atmospheric entry and landing will be monitored by the 2 NASA spacecraft in orbit about Mars and by the European Mars Express also there. The name Phoenix is symbolic, since it was made from parts of the cancelled Mars 2001 spacecraft.

International Space Station (ISS) – A new oxygen generator has been installed on ISS, which has the capacity for a 6-person crew. Previous oxygen generation was done by systems with smaller capacity. The new generator is the size of a refrigerator and produces oxygen by separating the atoms in water molecules. It of course produces hydrogen also, which is currently vented to space, but in the future will be recycled by a planned system to remove carbon dioxide from the station air. After a water recovery system and other equipment are installed next year, ISS should be ready for crews of 6 by 2009.

Instant AstroSpace Updates

Dusty variable star – Astronomers using 2 of the 8-meter Very Large Telescopes in Chile as an interferometer have detected a huge cloud of dust around the variable star RY Sagittarii, which is a member of the R Coronae Borealis class of variable stars. Stars in the R CrB class (as it is abbreviated) have long been thought to vary in brightness because of huge obscuring clouds of carbon dust being puffed out, then dissipating, but this is the first detection of such a puff.

Space Shuttle Endeavour launched on August 8 after a short delay to complete some fixes, including a pressure relief valve that was leaking air. After extensive examination, a gouge in a heat-protective tile that occurred during launch was deemed not bad enough to need repair before returning to Earth.

Analysis of **zircons** found in a meteorite believed to have come from the asteroid Vesta have been **dated** as having formed less than 10 million years after the formation of the planets 4.5 billion years ago.

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Additional Info on Snakebites:

Carroll Slemaker contributed the following information that he learned from a TV program called Venom ER that used to be broadcast on Animal Planet. The resident expert on the show was Dr. Sean Bush, professor at Loma Linda University & Medical Center, who specialized in treating rattlesnake bites (among others) and was also an expert on the snakes themselves, and he advised that different species of rattlesnakes produce different types of venom and there is no single antivenin that counteracts the venom of all species of rattlesnakes. If you or someone with you is bitten, it's very important to get as much information as possible about the snake that did the biting – it would be best to take the snake itself, if that can be done safely, but, if that isn't possible, pictures or at least a good description of the snake that includes its colors and patterns would help.

Carroll also mentioned that the antivenin treatment itself can have dangerous side-effects, and can cause life-threatening anaphylactic shock in susceptible patients. Trial-and-error treatment to identify the right antivenin is therefore not a good option, and providing any information that would help identify the species of snake can improve the chance that the right antivenin will be used and that potential side-effects will be minimized. Another interesting fact gleaned from the show – some species of rattlesnakes are a lot more poisonous than others, and the most toxic species (reportedly 16 times more toxic than a Diamondback) is the Mojave Rattlesnake, Crotalus scutulatus, one of the species of rattlesnakes found in the area of the Mojave Desert.

All of this just highlights the fact that prevention is a lot easier than dealing with the effects of a bite, so please keep the snake danger in mind while you are out at Anza, Black Star Canyon, or in any rural or wilderness area and take precautions. Many of us visit these types of areas frequently for years on end without ever seeing a live snake, so this isn't something you need to be totally paranoid about, just exercise reasonable caution, such as giving any snakes in your area time to get away from you, staying on open ground where you are more likely to see any snake that might pose a problem for you, and not putting your hands or feet into any crack or crevice that you haven't checked first to be sure it's free of residents.

A Night at Mt. Wilson

by Bob Buchheim

Several years ago, my wife and I noticed that everyone we knew who had gone to Alaska returned with the report that "It's amazing – I can't give you a description that is worthy of what you'll see – you simply have to experience it to understand." So we went, and they were right: as with a solar eclipse, no photograph or enthusiastic account can convey the impact. You really do have to experience it to understand how wonderful it is.

A similar you-have-to-be-there-to-understand-it experience is available to the astronomically-inclined southern California resident: the opportunity to spend a night with the venerable 60-inch telescope at Mt. Wilson Observatory. The Mt. Wilson Observatory Association allows individuals and groups to reserve the telescope, including a Session Director who will be your host and a Telescope Operator who will direct the telescope to your observing targets. Thanks to the generosity of Richard Guy, I was part of the OCA group that used the telescope on August 18th. It was a wonderful experience! The first object of the evening was Jupiter, just about at culmination an hour before astronomical twilight. Set against the creamy twilight sky, the giant planet was a fine target to show off the good seeing of the site and the resolution of the telescope. Three Galilean moons were visible as tiny disks, and the planet's clouds were a wonderful pattern of bands, swirls, white spots. The pale salmon "Great Red Spot" was clearly visible. Over the course of an hour as we all took turns staring into the eyepiece, the red spot moved noticeably across the face of the planet, and one of the moons disappeared behind Jupiter's limb. We were observing at 240X, using a 100mm EFL eyepiece. Remember how neat it was when you upgraded from 1.25" format eyepieces to 2" format? Well, the two standard eyepieces used on the 60-inch are 4-inch format! It's a pretty intimidating piece of glass when you first put your eye to it.

The telescope is fork mounted. Optically, it is a three-mirror bent cassegrain configuration. Instead of a hole through the primary mirror (as in a conventional cass), there is a flat tertiary mirror that directs the light cone to a focuser on the side of the 'scope (sort of like a newtonian focus, except that it's located just above the primary mirror). With this arrangement, the eyepiece can be a bit tricky to reach at times. For example, when we were viewing Jupiter, the eyepiece was on the top side of the telescope tube – i.e. about 12 feet above the observing floor, and a couple of feet skyward from the rear of the tube. To observe, you climb a tall industrial ladder that is rolled up behind the telescope. Our host explained that the proper observing position in this situation is to have one foot on the platform of the ladder, and your other foot on the rear ring of the telescope as you lean over to peer into the eyepiece. This was a new type of observing acrobatics! Most of you are probably pretty careful to avoid touching your telescopes when making a critical observation, to avoid creating any shaking or vibration. Well, when you're using an instrument that is made of about 20 tons of steel, it turns out that you can touch it, lean against it, and even stand on it without making any noticeable effect on the stability of the image.

At several times during the night, our host explained some of the features of this instrument and the observatory that houses it. A flashlight shining up from below the mirror mount highlights the beautiful green color of the wine-bottle glass that the

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What have you been doing in the Dark?

Have you been doing a project that other OCA members would be interested in learning about? Have you participated in an astronomical activity that would entertain the other OCA'ers? For example, perhaps you have:

- Taken an astronomically-oriented expedition (stargazing at Lake Titicaca?)
- Made a telescope or an optical instrument (a handicap-friendly telescope?)
- Conducted a research project or astronomical investigation (photometry? double-stars? spectroscopy?)
- Exposed the stars at a unique "outreach" venue
- Made an unusual observation (anyone discover a supernova or asteroid?)
- Participated in a special activity by one of our Special Interest Groups (visited a major observatory? Used a remotely-operated telescope?)

If you have, then it's time to start thinking about your presentation for the "Member's Night" December OCA Meeting. Don't keep it to yourself: Inquiring minds will want to know what you've been doing in the dark!

The OCA is filled with inventive people doing new, intriguing, and wonderful things. We'd be delighted if you would present a 10-15 minute description of one of your astronomical activities at the December OCA meeting. To add your name to the presenter's list, please contact Craig Bobchin by e-mail at ETX_Astro_Boy@sbcglobal.net

WANTED: I am interested in buying an observatory with a warming hut at Anza. If you are interested in selling yours, please email me. Thanks, Ray Stann

Contact: r_stann@yahoo.com

2-inch new (not used) eyepieces from Surplus Shed. One is 10 mm focal length for $40; the other is 38 mm focal length fo $60; these only fit 2 inch focusers. Also selling 2 different new (in box) green laser pointers, one with constant on switch (just like a flashlight) for $135, the other with a momentary switch (release and it goes off) for $80. These are both 4 times as bright as the pointers commonly seen. Ph: 909-861-6461 or email scopeguy20@gmail.com

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FOR SALE: Celestron CR 150hd Dual Axis Drive CG5 Mount. New motors and hand controller; roll-about hard case. Nice condition. $750.00
Meade LXD55 8 inch Schmidt Newtonion. Recent complete service by Meade, new Autostar, etc. Roll-about hard case. Nice condition. $800.00
Contact Steve Bird 562 234-2157

FOR SALE: Meade 8-inch LX200 GPS w/all factory accessories; aluminum channel tripod w/pneumatic tires. Contact Bob Krause at 949-248-3111

Oh, dear: double-check your optical testing equipment!
by Bob Buchheim

You all probably remember the sick feeling in your stomach when you first heard about the fabrication flaw in the mirror of the Hubble Space Telescope. The "root cause" was an unfortunate goof-up in optical testing. The specifications for the mirror were so tight that Perkin-Elmer had to design and build a super-precise interferometer to do the testing of the big mirror. Unfortunately, nobody realized that the newly-built interferometer had unrecognized spherical aberration within it. Hence, the big mirror was polished to a precisely spherically-aberrated figure.

Sad story, but happily a combination of clever image processing and (later) installation of a corrective-optics assembly has enabled the Hubble to deliver an astounding array of scientific results and gorgeous images.

I innocently assumed that this would be the first and last such mistake. But an article in the April 2007 *Publications of the Astronomical Society of the Pacific* had a title that caught my curiosity: "Restoration of Images of Comet 9P/Tempel 1 Taken with the Deep Impact High Resolution Instrument" (by D. Lindler, et al). Remember that *Deep Impact* sent an impactor into the comet to blast out a sample of the material beneath the surface – an exciting and very successful mission.

Why was image restoration needed? Because the imager was accidentally placed 6.4 mm behind the focal surface of the telescope. How did that happen? Quoting from the PASP article: "The spacing was incorrectly set during ground testing based on optical tests performed at a cold operating temperature. The cause of the problem was traced to a cryo-flat used during ground calibration that developed optical power at cold temperatures." Oh, dear!

I don't remember this getting any publicity during the mission. I mention it here because some of you are involved in spacecraft design and fabrication, and aerospace product development. So am I. And I sometimes get frustrated with how long it takes my engineers to conduct a seemingly straightforward test or experiment. Many times, the explanation for the larger-than-hoped-for cost and schedule hangs on the need to confirm that the instrumentation is calibrated for the test conditions being used, confirm that the experiment will deliver the information that is desired, and confirm that the data is an accurate representation of "truth" (i.e. the data isn't corrupted by unforeseen offsets or gain errors).

I can't say that I'm always graceful about accepting such explanations. But events like the Deep Impact telescope deserve to be widely known in the aerospace community, to remind us (engineers, technicians, and managers) that things may not be what they seem to be, and that they can go horribly wrong without any alarm bells being rung. It is very important to take the time to ask, "Why do I believe that this test, fabrication method, or integration check is adequate?" and "How do we know that the test equipment and test method are able to deliver what we're expecting of them, in the conditions that we're using them?" When you're asking and answering these questions, demand that your team apply both historical knowledge of past events (like *Deep Impact*) and fertile imaginations. There may be only one way for things to "go right", but there is a near- infinite number of ways that things can "go wrong".

By the way, the OCA Library receives the PASP each month, and it is available for you to check out and peruse. See Karen for the current year's issues. ■

Autoguiding with the Kuhn Telescope

by Pat Knoll

The first successful images using a prototype autoguiding interface with the 22-inch Kuhn telescope were captured on August 4, 2007. I and Barbara Toy were present when the sky suddenly decided to become unstable while the session was in progress. We had spent some time on a previous evening tweaking the Kuhn's collimation.

However, the operation was successful. The camera (ST8XME) and autoguiding was controlled by CCDSoft version 5. Also attached to the camera for this session was a SBIG AO-7. A while back we had to modify one of the parameters for guiding in Comsoft from 5 ms to 10ms. The next objective is to autoguide the telescope using the 4 inch Vixen refractor attached to the Kuhn. Once this is successfully accomplished, I will submit all the data to Barbara for publication. It has been an enjoyable challenge trying to bring this telescope up to speed for today's amateur equipment.

The Kuhn, ready for action! (Pat Knoll) ■

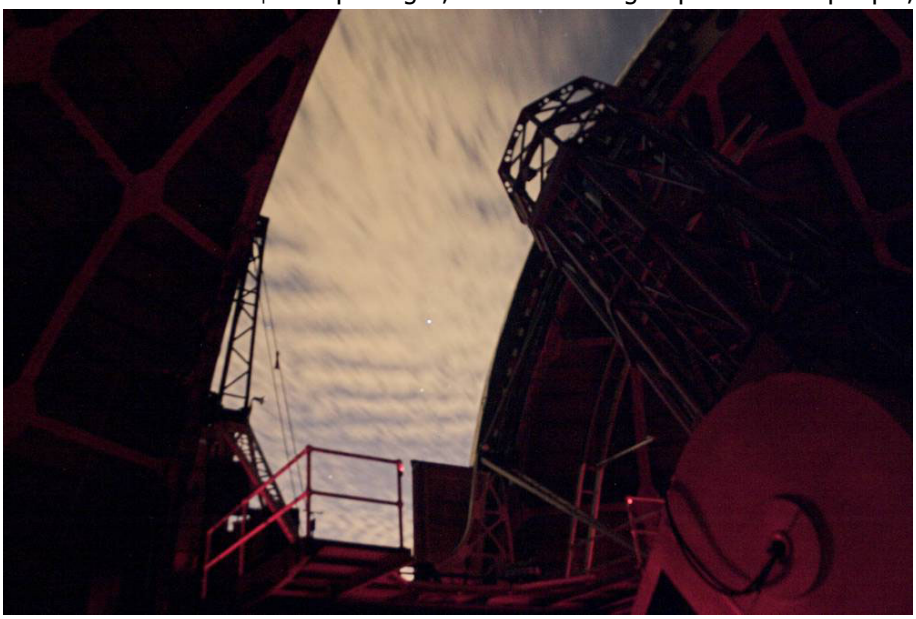
primary mirror is made of. A series of cantilevered weights press against the underside of the primary mirror, so that as the telescope's orientation changes, the weights put compensating pressure onto the underside of the mirror. The telescope's original design allowed the tertiary mirror to be rotated so that it directed the light cone down along the polar axis to a very-long-focal-length coudé focus. This focal plane was used for high resolution stellar spectroscopy (one of the principal reasons for building the instrument). A tricky mechanical gear-and-cable mechanism mounted on the side of the telescope tube provided the half-angle motion that moved the tertiary mirror so that the light path to the (no longer used) coudé focus was stable as the telescope followed the stars. The polar axis and polar drive of the telescope are mounted on the level below the observing floor. It is a massive steel structure. I estimate that the main gear is about 5 feet in diameter, and its beefy wheel and ring wouldn't be out of place in a ship's engine room. The main gear is driven by a worm that's about 3 inches in diameter. The worm is driven by a shockingly tiny geared motor: the telescope is so finely balanced that it takes almost no torque to drive it.

The telescope became operational in 1908, so it will celebrate its centenary next year. The whole system – telescope, mount, drive, and building – is a marvel of early 20th century construction technology, featuring heavy steel beams, castings, and braces. The whole set-up gives you the feel of a warship – steel ladders and gangways, heavy railings, a solid steel exterior door, and the eerie creaking and scraping of a really big steel structure being moved whenever the dome rotates. The electronics are definitely last-century: fist-size relays to control the 100+ VDC that feed the dome motors, and a gigantic knife switch that's straight out of Frankenstein's laboratory to raise and lower the dome's shutter. Even if you didn't want to look through the telescope, the opportunity to study the instrument and its housing is worth the trip up the mountain.

But look through it we did, indeed. NGC 6572, the "blue racquetball" planetary nebula was a brilliant sky-blue disk, surrounded by pinpoint stars. M-13, the great globular cluster in Hercules had a "three-dimensional" appearance with myriad tiny resolved stars sitting on top of the cluster's misty unresolved core. The three-bladed "propeller" feature was clearly visible to everyone. The "cat's eye" planetary nebula (NGC 6207 in Draco) was stunning: its central star a little spark of light, surrounded by a complex multi-ring nebular glow. Someone suggested the double-double in Lyra, which was a neat sight. Both components were cleanly split, and the pairs were separated by over half of the visible FOV. (The total field at 240X is about 11 arc-minutes).

The nearby 16-inch telescope was also available to us, being operated by OCA's own Matthew Ota. He has been a volunteer operator at Mt Wilson for a decade now, supporting the Telescopes in Education project, and providing viewing experiences for guests to the observatory complex. The 16-inch Meade SCT is housed in a dome that was originally home to a 6-inch refractor. This dome is a neat design, composed of two hemispheres, one nesting inside the other. Rotate one, and instead of a "slit", you get an opening that encompasses one half of the sky. To orient the opening, a geared hand-crank moves the whole dome assembly. I was surprised at how smoothly the dome moved, and how little effort is required to crank it around – another triumph of early 20th-century craftsmanship! Even though sky conditions were not great on the night I was there, it was a wonderful historical and astronomical experience.

Dick Greenwald has organized the OCA's nights with this telescope during 2007, providing a great service to our members. If you haven't taken advantage of this opportunity, I encourage you to fit it into your schedule. There is only one "OCA" night left this year (Friday, October 5th). If you'd like to join the group, you can contact Dick by e-mail at RDGreenwald@Earthlink.net. The Mt Wilson cost is $1200 per night, so for an OCA group of a dozen people, it's $100 per person. ■



Cloudy Night at Mt. Wilson, 8/18/07
(Sheryl Benedict)

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