SIRIUS ASTRONOMER

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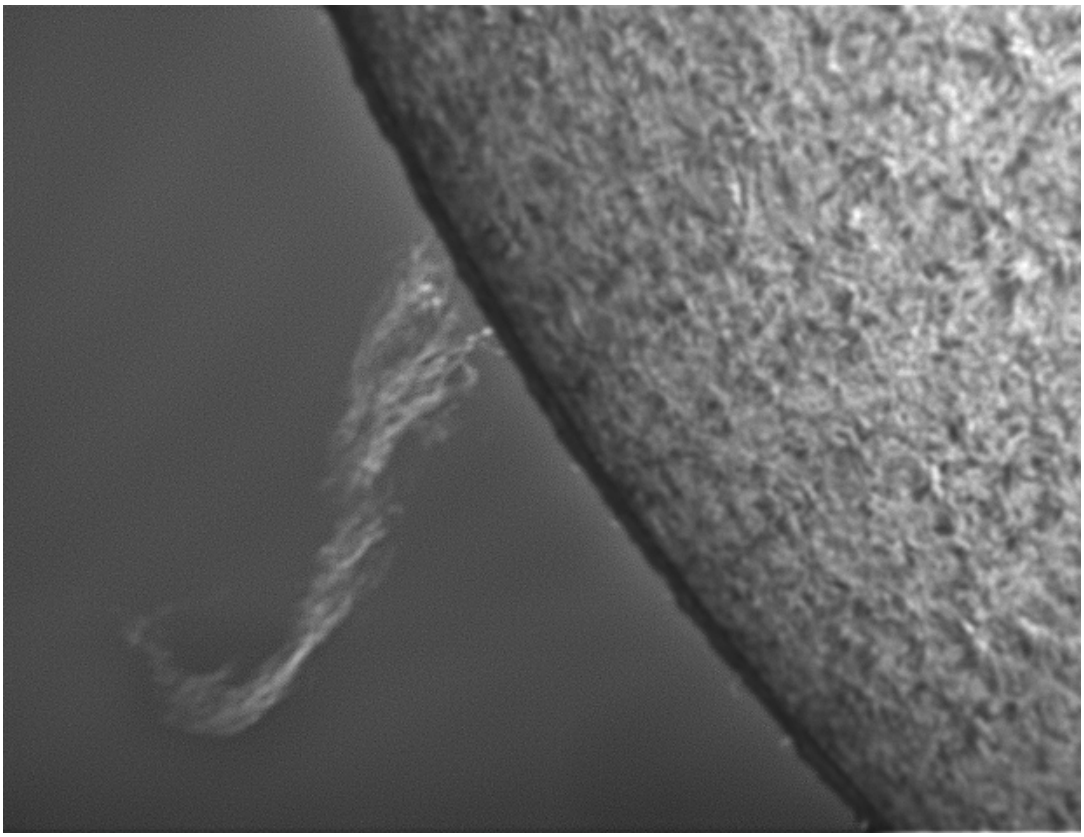
The Newsletter of the Orange County Astronomers

October 2006 *Free to members, subscriptions $12 for 12 issues* **Volume 33, Number 10**



This H-alpha image of a solar prominence was acquired by Pat Stoker on September 21st from Anaheim. Thankfully solar astronomy has little to fear from light pollution!

OCA CLUB MEETING

The free and open club meeting will be held Friday, October 13th at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. The featured speaker this month is Dr. Jim Parker, planetary geologist with the Jet Propulsion Laboratory.

Next General Meeting: November 10th

STAR PARTIES

The Anza site will be open this month on October 21st. The Black Star Canyon site will be open this month on October 28th. 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, October 6th (and next month on November 3rd) at the Centennial Heritage Museum at 3101 West Harvard Street in Santa Ana.
GOTO SIG: TBA (contact coordinator for details)
Astrophysics SIG: Oct. 20th, Nov. 17th
Astro-Imagers SIG: Oct. 17th, Nov. 21st
EOA SIG: Oct. 25th, Nov. 29th
Dark Sky SIG: TBA (contact coordinator for details)

President's Message

By Barbara Toy

Well, the nights cooled off pretty quickly this year – by mid-September, everyone I saw out at Anza was breaking out their heavy jackets and other cold-weather gear, and I understand it was even getting chilly at Black Star Canyon for that September star party. As I'm writing this, the temperatures at Anza have been down in the low 40's overnight. On the brighter side, the skies have been a lot clearer than over most of the summer – which makes dealing with a bit of cold well worth while! No doubt it'll be colder yet when true winter sets in, but I hope you won't let that stop you from coming out for the star parties, either at Anza or Black Star Canyon.

If you come prepared (with hats, gloves, boots or other warm foot gear, and heavy jackets and warm pants, maybe thermal underwear, maybe some of those chemical warmers to help keep your hands and feet warm) and put on your additional warm layers when you just start to cool off and before you really get cold, you can stay surprisingly comfortable when the outside temperatures go into the 40's and even down into the 30's. After the first few cold nights, you'll find that you become more acclimatized, so it's easier to stay comfortable, often with fewer additional layers than those first nights of true cold. If you're out at Anza, you have the option of warming up in Anza House if you get too cold, and, at the star parties at least, you can come up to the club observatory where the observing area is usually a bit more protected than the open pads and you can warm up in the warming room between sessions of looking at cool objects through the Kuhn. So don't write the winter off as too cold and uncomfortable for viewing or imaging – that's not the case at all!

Need Assistant(s) for Don Lynn…

Speaking of Anza, our long-time Anza site custodian, Don Lynn, needs some assistance. Although different people have helped out with different aspects of taking care of the Anza site at different times, the vast bulk of the day-to-day work needed to keep the Anza site going for the last twenty plus years has been done by Don. Besides dealing with such things as the plumbing, electrical lines and receptacles, concrete work, filling animal holes, painting, clearing brush, repairing fencing and other items far too numerous to mention, he's been actively involved with development of new areas and (more recently) has undertaken to install the fence posts for the perimeter fence himself. Actually, all that's just the tip of the iceberg, as every time something new crops up (such as when the well pump went out before the August star party), I find out about a bunch of additional things he's been doing all along.

He's now advised the Board that he needs some help, and maybe even someone who will ultimately take over the position of Anza Site Custodian. If you've got some good handyman-type skills and would be interested in helping out with the ongoing maintenance of the Anza site, please contact me or contact Don directly about it. His email address is donald.lynn@alumni.usc.edu (actually, you can find the contact information for both of us on the back of the Sirius Astronomer, or on the "Contacts" page on the website).

Don is so capable and has such a wealth of information about all aspects of the Anza site that I hope he will be willing and able to stay involved with it for a long time to come. However, what's involved in maintaining the site has certainly increased over the years, as more of the site has become developed, and, now that the issue has been put before us, it's amazing that Don's been able to carry on for the most part on his own with only sporadic assistance for so long. We do need to give him whatever help he can use, maybe even an "Anza Maintenance Team." If you can see yourself as part of such a team, please speak up!

And many thanks to Don for all he's done out at Anza over the years, and all he does in other areas of the club!

Black Star Canyon

I feel I've been slighting Black Star Canyon a bit this last year. We do mention the star parties at Black Star Canyon at the club meetings, and they're listed on the first page of the Sirius Astronomer as well as on the website calendar, but it seems that what's going on at Black Star is generally overshadowed by what's going on at Anza. This isn't fair to the BSC regulars, or to Steve Short, the BSC Coordinator, who goes out of his way to make these "in county" star parties fun for new people as well as the regulars.

"BSC" is our handy shorthand for Black Star Canyon, and this is the most recent of the sites in the Santa Ana Mountains that we've been allowed to use through the generosity of the Irvine Co. Our earlier site was in the hills west of Silverado Canyon, a mile or so from the BSC site. When the Irvine Co. turned the management of that whole area over to the Nature Conservancy, the Silverado site was identified as an area that needed a lot of restoration, and they didn't want anyone using it as that would get in the way of the restoration work. We were offered the BSC site in its place, and found that it actually gave us darker skies

for viewing because it was in a canyon area and the surrounding hills blocked a lot of the sky glow from the rest of Orange County.

Although we can't put in pads to make BSC more astronomer-friendly, there have been a number of improvements the Nature Conservancy has made to the area we use during the time we've been using the site. There's now a picnic area with tables, and the dirt access road is kept in much better condition than the road to the old Silverado site (and it's a much shorter drive from the paved road to the area used for viewing). A more mixed blessing is the picturesque planter area of native brush surrounded by rocks that is a nice addition to the area by daylight, but can be a driving hazard at night, as it's in the middle of the roadway and apparently was meant as the center point for a turnaround. Steve regularly sets up red warning lights around it so people driving in or out using their parking lights only (as everyone coming to the star parties needs to do after dark) can see where it is and not hit any of the rocks. He's also been setting out other red lights to act as guides, so people can find their way to the viewing area more easily.

Black Star Canyon is a 20 to 40 minute drive from most of Orange County, so it's much closer to most of our members than Anza. The star parties there are generally smaller and more cohesive than at Anza, as everybody is set up in the same area and it's easy to see who's there and to visit among the various scopes. It's also easier for people to decide to "just drop by to see what's going on" when the site is open for the monthly star party than it is at Anza – I've done that myself, and found it a lot of fun just to see who's there and to wander around talking to people and looking through all the different telescopes when I wasn't able to bring my own. You'll find people there doing serious viewing (and even some imaging) as well as socializing, and a lot of camaraderie not just among the regulars at the site but extending to less frequent visitors and newcomers as well. People who haven't been to many star parties or who may not know many people in the club yet often find the BSC star parties less intimidating than the Anza parties, as it is often easier to meet people and fit into whatever is going on (that's a big advantage of smaller, more intimate star parties).

If you're interested at all in going out to any of the Black Star Canyon star parties, you should get on Steve Short's email list. He sends out notice of when he expects to open the gate, so you can plan when to get there, and he's also followed the practice started by his predecessor in his position, Bob Buchheim, of including a list of good objects to view around the time of the star party. To get on his email list, just email him at SteveS@inductor.com. Steve also regularly gives a "sky tour" to guests and others who come out to BSC and who may be new or fairly new to astronomy, and he helps people out who are having problems with their equipment – he really keeps himself busy on star party nights, and says he enjoys it, even though it means that he doesn't get time to do much viewing for himself.

The BSC parties are generally the week before the Anza star parties, though not always; we set the Anza parties on the Saturday closest to new moon and BSC on the next closest Saturday, so you could attend both parties each month. The dates of all the club's star parties are shown on the website calendar and the star parties for each month are listed in the message on Starline as well as shown on the front of the Sirius Astronomer and the home page on the website, and they are also announced at the club's general meetings, so there are a number of ways you can find out when the upcoming parties are set. If you haven't been to any of the Black Star Canyon parties yet, I hope you'll make a point of going at least once – if the weather cooperates at all, I think you'll have such a good time that you'll make that the first of many visits!

What Kinds of Activities Would You Like To Do Through the Club?

I had an interesting email exchange with John Sanford recently about what the club could or should be doing in the future that might be different from or in addition to its current activities. For those of you who joined the club after John retired and moved to Springville up in the Sierras, he was a long-time very active member who, among his many club roles, served as president for several terms, as secretary, as editor of the Sirius Astronomer, and innumerable other positions and activities. Even though he's now got an observatory of his own under darker skies than we have at Anza, and even though he's got a local astronomy group in his new home community, I'm happy to say that he maintains an active interest in OCA. I'm one of the members who joined too late to know him when he still lived in Orange County, but I've been fortunate enough to get to know him through seeing him at RTMC and various club events he's attended as well as by email.

One point John made was that, while we have a lot of members who have a strong interest in the various projects going on at our Anza site, we also have a lot of members whose astronomical interests lie in completely different directions. We do have a wide range of club activities that are completely independent of Anza – such as the activities of our various special interest groups, our BSC star parties, our outreach programs and the speakers and presentations at our general meetings – but it's been quite a while since we've checked with our general membership to see if there are needs or interests out there that we could be addressing but are not.

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AstroSpace Update
October 2006
Gathered by Don Lynn from NASA and other sources

Chandra (orbiting X-ray observatory) has imaged the Bullet Cluster of galaxies, which is colliding with another smaller cluster of galaxies. Chandra found that the clouds of hot gas surrounding the clusters are not centered about the galaxy clusters. This positions observed can happen only if the clusters are surrounded by clouds of dark matter (matter which is not ordinary matter composed of protons, neutrons and electrons), which is gravitationally pulling the hot gas. Dark matter clouds would pass through each other during the galaxy cluster collision, slowed only by their gravity, while the galaxies themselves would be slowed both by gravity and by friction with gas. Alternate theories to dark matter, such as modified gravity theories, predict a different configuration of the gas and galaxies during such a collision as this. So this is considered the strongest observational evidence yet for the existence of dark (not ordinary) matter. Gravitational lensing seen in images taken with the Hubble Space Telescope and other ground-based telescopes was used to determine the distribution of mass within the galaxy clusters, to combine with the Chandra observations of the hot gas.

Planethood – As promised, the International Astronomical Union (IAU) did indeed decide at its late August conference on the definition of a planet. The committee that had been deliberating this issue for months came up with an unexpected definition that not only allowed Pluto and the newly discovered slightly larger object 2003 UB313 to be classified as planets, but also some of the larger asteroids, including Ceres. Of course the full IAU tinkered with the committee's definition, and now those 3 (Pluto, UB313, Ceres) are to be called Dwarf Planets, leaving only 8 genuine planets in our Solar System. The new definition says that a planet 1) orbits the Sun, 2) is massive enough to have pulled itself gravitationally to a nearly-round shape, and 3) has cleared other objects from the vicinity of its orbit. This last clause prevents all asteroids and Kuiper Belt Objects (including Pluto) from being planets. Objects that fit the first 2 requirements, but not the "clearing of its vicinity" are to be known as dwarf planets. The definition was adopted by a vote when only a bit over 400 members were present (half of whom declined to vote), out of the 10,000 IAU members. So it easily may not represent the majority view of the IAU. Voting was generally split between planetary geologists (supporting Pluto's planethood) and planetary orbit scientists (opposing Pluto). Hundreds of astronomers have signed a petition to the IAU to reconsider this decision. Mike Brown, the discoverer of 2003 UB313, said the new definition made sense scientifically. What he did not say after the vote was what many of you heard him say in his talk at RTMC last May: that culturally, it did not make sense to demote Pluto, since the general public believes Pluto is a planet, and that will be hard to change. The committee had also recommended a definition for a double planet, which would have included only Pluto and Charon among known objects (it narrowly excluded the Earth and our Moon), but the IAU did not accept this. The new planet definition also is unsatisfactory to those who wanted a definition that works outside our Solar System (that is, for exoplanets), or those who wanted to define the upper limits of planets, namely the distinction from brown dwarfs. The IAU adopts definitions (and other resolutions) only at its General Assemblies, which occur every 3 years. So they have a lot of time to think about reconsidering. And we will have only 8 planets for at least 3 years. But we may have a dozen or so new dwarf planets, as soon as it can be determined if the largest asteroids and Kuiper Belt Objects are nearly round.

FUSE (orbiting far ultraviolet observatory) has found that deuterium (hydrogen with an extra neutron) apparently binds to interstellar dust grains. However, sources of great heat, such as supernovas and hot stars, can vaporize the dust and return the deuterium to the interstellar gas. This explains why not enough deuterium has been found in the Milky Way (it is undetectable when bound to the dust). Theory predicted how much deuterium had to have been created by the Big Bang, and the amount in our galaxy simply didn't measure up. FUSE observations also showed why deuterium is so unevenly distributed throughout the Milky Way (dust to bind to is unevenly distributed, as are sources of heat to release bound deuterium). These have both been long-standing mysteries to astronomers studying our galaxy.

Millennium Galaxy Catalogue is a new survey of over 10,000 galaxies that was completed using telescopes in Australia, the Canary Islands, and Chile. It includes information on the sizes of galaxy disks and central bulges and accurate distances to the galaxies. From this data a study concluded that of the normal matter (protons, neutrons, electrons) produced in the Big Bang, 20% of it has formed into stars, 0.1% is dust that was expelled from stars, and 0.01% of it is in supermassive black holes at the centers of galaxies. The remaining approximately 80% is gas that has never collapsed into stars.

Mars Express has observed the highest clouds above any planetary surface, at 50 to 60 miles above Mars. The clouds are most likely frozen carbon dioxide. The clouds were detected by watching stars disappear behind Mars, dimming as they passed behind clouds in the atmosphere. In over 600 such observations, about 1% of them showed the presence of these very high clouds. They probably would look from the surface of Mars like noctilucent clouds appear from Earth, but those on Earth do not extend above 50 miles.

Mars Odyssey has been observing the Martian polar ice cap as it melts with the spring season. Study of these observations shows that jets of carbon dioxide gas burst through holes in the dry ice (frozen carbon dioxide) as they form, throwing sand and dust a couple of hundred feet into the air. Apparently the Sun shines through clear spots in the dry ice to evaporate it on the under side, where gas builds up pressure until holes form in the melting cap. This explanation fits the observations of dark spots, fan-shaped markings, and spider-shaped features that appear and then fade during the spring polar melt. The dark spots were originally thought to be holes melted in the cap, but are now believed to be dark sand under the cap showing through clear spots. The other types of marking appear later, after pressure has built up at the dark spots and it eventually finds a way to release in jets. The fan-shaped markings are where debris from the jets falls. The spider-shaped markings are where gas pushes debris under the ice toward the jet. Infrared temperature measurements also support this explanation.

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Staggering Distance

By Dr. Tony Phillips

Tonight, when the sun sets and the twilight fades to black, go outside and look southwest. There's mighty Jupiter, gleaming brightly. It looks so nearby, yet Jupiter is 830 million km away. Light from the sun takes 43 minutes to reach the giant planet, and for Earth's fastest spaceship, New Horizons, it's a trip of 13 months.

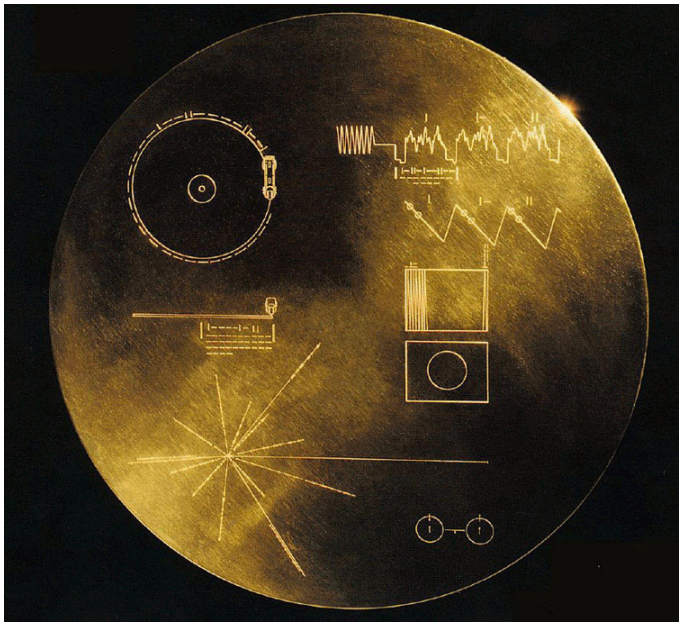
That's nothing.

Not far to the left of Jupiter is Pluto. Oh, you won't be able to see it. Tiny Pluto is almost 5 billion km away. Sunlight takes more than 4 hours to get there, and New Horizons 9 years. From Pluto, the sun is merely the brightest star in a cold, jet-black sky.

That's nothing.

A smidgen to the right of Pluto, among the stars of the constellation Ophiuchus, is Voyager 1. Launched from Florida 29 years ago, the spacecraft is a staggering 15 billion km away. It has traveled beyond all the known planets, beyond the warmth of the sun, almost beyond the edge of the solar system itself.

Now that's something.



In case it is ever found by intelligent beings elsewhere in the galaxy, Voyager carries a recording of images and sounds of Earth and its inhabitants. The diagrams on the cover of the recording symbolize Earth's location in the galaxy and how to play the record.

"On August 15, 2006, Voyager 1 reached the 100 AU mark—in other words, it is 100 times farther from the Sun than Earth," says Ed Stone, Voyager project scientist and the former director of NASA's Jet Propulsion Laboratory. "This is an important milestone in our exploration of the Solar System. No other spacecraft has gone so far."

At 100 AU (astronomical units), Voyager 1 is in a strange realm called "the heliosheath."

As Stone explains, our entire solar system—planets and all—sits inside a giant bubble of gas called the heliosphere. The sun is responsible; it blows the bubble by means of the solar wind. Voyager 1 has traveled all the way from the bubble's heart to its outer edge, a gassy membrane dividing the solar system from interstellar space. This "membrane" is the heliosheath.

Before Voyager 1 reached its present location, researchers had calculated what the heliosheath might be like. "Many of our predictions were wrong," says Stone. In situ, Voyager 1 has encountered unexpected magnetic anomalies and a surprising increase in low-energy cosmic rays, among other things. It's all very strange—"and we're not even out of the Solar System yet." To report new developments, Voyager radios Earth almost every day. At the speed of light, the messages take 14 hours to arrive. Says Stone, "it's worth the wait."

Keep up with the Voyager mission at voyager.jpl.nasa.gov. To learn the language of Voyager's messages, kids (of all ages) can check out spaceplace.nasa.gov/en/kids/vgr_fact1.shtml .

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

(continued from page 4)

Mars rover Opportunity should have reached Victoria Crater by the time you read this. This crater is about 4 times the diameter and much deeper than Endurance Crater, in which the rover spent a few months of 2004. Images from orbit show that Victoria exposed a stack of rock layers about 100 to 130 feet thick. A lot of Martian geological history can be learned by reading these rocks. The first work at the crater will be to observe from various locations around the rim to see if there is a safe way to enter and exit. During the long drive (over 3 miles) from Endurance to Victoria, the rover has found evidence of a history of shallow lakes, drier periods of shifting dunes and groundwater levels that rose and fell, and minerals indicating ancient water was very acidic. Mars Reconnaissance Orbiter will begin its observations from orbit in November, and one of its targets will be Victoria Crater, to have coordinated observations with Opportunity. The rover and its twin Spirit have now completed over 10 times their originally planned 90 (Martian) day missions.

Lithium – It has long been a puzzle why the element lithium seems to be lacking in old stars. The Big Bang produced more lithium than is measured spectroscopically in old stars. New observations of an old globular cluster NGC 6397 made with the 8-meter Very Large Telescope in Chile show that stars further advanced in their evolution have less lithium on their surface, matching a theory that says the lithium sinks within the star. The rate at which it sinks matches computer models of stars only if considerable mixing is occurring, that is, matter circulates between the interior and surface. Now they have a new mystery to solve, that of why so much circulation is going on.

Hubble Space Telescope (HST) has taken a very long exposure (5 days) of part of the globular cluster NGC 6397 in an effort to image all stars, even the dimmest ones. Red dwarf stars were identified in the image as having the lowest mass theoretically possible that still sustains nuclear fusion. White dwarf stars that had cooled to the theoretical lowest temperature possible were found. So the astronomers making the study concluded that the dimmest possible stars had been reached. This is the first time white dwarfs have been observed whose atmospheres had turned blue due to chemical reactions that occur only at low temperatures (low for a star), though this effect had been predicted theoretically. Astronomers can tell the age of a white dwarf by the temperature, and the oldest ones in this globular were found to be nearly 12 billion years old. The new image was compared with old HST images to measure the motions of the stars in order to find any foreground or background stars by their different motion, and so remove them from the study. Counts of all stars, down to the dimmest, are important for verifying star formation theories. This has never been accomplished before this image.

Quintuplet Cluster – The Keck 10-meter telescope in Hawaii has used adaptive optics to obtain the finest resolution image (even better than HST) of the Quintuplet Cluster, a group of 5 huge stars found near the center of our Milky Way galaxy. This was done in infrared, which penetrates the thick dust that lies between us and the galactic center. The stars were shown to be massive binary stars that produce large amounts of dust. The image showed pinwheels about the 5 stars, which are features that resemble a single-arm spiral galaxy (but are much smaller). Pinwheels are known to be caused only by dusty binary stars that are so close that their stellar winds collide. The orbital periods and separation can be measured from the pinwheel, even though the stars are too close to be seen separately. Only a few pinwheels have ever been found, so adding 5 new ones is significant.

Galex (orbiting ultraviolet observatory) surveyed 800 nearby elliptical galaxies and found that the more massive the galaxy, the less likely it was to have young stars. It is known that black holes at the centers of galaxies are proportional in size to the galaxy – that is, the more massive the galaxy is, then the more massive the black hole at its center. So the observation is being interpreted to say that the more massive the central black hole is, the more star formation is stifled. This had been predicted theoretically, so this observation tends to confirm the theory.

Magnetar – Most known neutron stars emit pulses of radio waves, and hence are called pulsars. Some pulse in visible light or other wavelengths. About a dozen of the known pulsars have extremely strong magnetic fields, 100 to 1000 times stronger than that of normal pulsars, which are themselves strong. All the known magnetars emit X-ray pulses, but not radio pulses, until now. The new discovery was made by the Very Large Array radiotelescope in New Mexico when it observed a magnetar that had been discovered 3 years ago by the Rossi X-ray orbiting observatory. It is about 10,000 light-years away in Sagittarius. Most pulsars fade away at higher radio frequencies, but this one remained strong past 140 gigahertz, the highest radio frequency ever seen from a pulsar. The strength and shape of the pulses vary from day to day, unusual for a pulsar. That is probably caused by shifts in the magnetic field from day to day. Radio astronomers will continue to observe this magnetar in hopes of understanding why it is so different from others.

Reminder: No Smok
(except inside your

I recently received a complaint about
pad area of the Football Field during a
indicate that a review of the "no smok
overdue. Putting it simply, smoking is
inside a vehicle.

There are several reasons this policy
important is that we have a serious fi
"no smoking" policy is an important p
fire. Other reasons the club adopted
fine optics and it doesn't limit its effec
there are health concerns for people w
hand smoke, which includes people w
who have problems with asthma; and
genuinely annoyed by the smoke whe
even when it doesn't make them ill. W
recognized that smokers need to have
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If you are a smoker, we are sorry for a
cause you, but the policy *is* necessary
your fellow members. Please follow t
Anza site as a member could be revok

If you are at the Anza site and observ
not in a vehicle, you can (politely) adv
that he or she comply with it, but plea
Board member who is on site if that d
than attempting further enforcement
member is on site at the time, please
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that would allow the offender to be id
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it to those who are authorized to act o
situation rather than taking further ac

Fortunately, we don't get many compl
policy – my thanks to all of you who c
the few who violate it do so out of ign
about the policy, please feel free to e

Integral (European orbiting gamma-ray telescope) detects gamma rays, at least small amounts of them, anywhere it points in the sky. It is believed that this "gamma-ray background" is the result of multitudes of weak sources blending together like stars do in the Milky Way seen with the naked eye. Recent work with X-ray telescopes showed that the X-ray background comes from many distant supermassive black holes, and it is thought the same is true for gamma rays. To improve the resolution, Integral recently performed an experiment, letting the Earth drift through its field of view, blocking the gamma rays progressively as it moved. Integral can detect X-rays as well as gamma rays, so both were monitored during the experiment. The problem was that Integral uses a visible-light telescope to guide its telescopes, and the Earth in the field of view destroys guiding. So the observatory was reprogrammed to guide without using the visible-light telescope. Study of the Earth-occulting experiment observations is expected to show how many and how strong the individual gamma-ray and X-ray sources are that make up the backgrounds.

Trans-Atlantic Exoplanet Survey (TrES) uses small (4-inch) telescopes and camera lenses at Palomar, Flagstaff, and the Canary Islands to monitor tens of thousands of stars every clear night, looking for a planet to transit in front of a star. Lots of candidates for transits are found, but upon further types of observations, most turn out to be binary stars. The survey has now discovered 3 planets. The latest orbits its star every 2.5 Earth days and is classified as a "hot Jupiter" (planet roughly the size of Jupiter, but far closer to its star, so it is much hotter). It is the first planet found in an area of the sky that is targeted for a heavy-duty planet search with the Kepler satellite to be launched in 2008. Kepler should be sensitive enough to find all the planets and some moons in planetary systems orbiting some nearby stars. It is amazing that planets can be discovered with 4-inch telescopes, but that they are verified with 400-inch scopes (the Keck Telescopes).

Mariner 4 made the first successful flyby of Mars, in 1965. 2 years later, while coasting about the Sun, it encountered meteor impacts that lasted 45 minutes and knocked the spacecraft out of orientation and ripped away bits of insulation. The impacts were more intense than any meteor shower or storm ever recorded on Earth. The spacecraft was not crossing the orbit of any known meteor shower. A recent study of the event shows that the spacecraft may have been passing through Comet D/Swift. This comet was discovered in 1895, but apparently broke apart before its next predicted appearance, since it was never seen after early 1896, though its orbit indicated it should return every 5 years. The "D" in D/Swift is used for comets that are lost. The orbit is not well known, since it was not observed long enough, but the best estimate puts it close to the location of Mariner 4's event.

Earth-like planets – New computer models of how planets form show that systems that produce hot Jupiters would also produce Earth-sized planets about 1/3 of the time. In some cases, the massive planet throws material into areas where it coalesces into rocky planets. Also, many times icy bodies form in the outer regions of such systems, and later collide with the rocky planets, turning them into ocean-covered planets. The most commonly used technique for finding planets is sensitive to massive planets close to their stars, so many hot Jupiters have been found. The question that this study answered is whether Earth-like planets could also be present in such systems.

New solar cycle – Each successive solar sunspot cycle of about 11 years has the magnetic field of sunspot pairs reversed from the previous cycle. That is, the leading (first in the rotation direction) spot of each pair of sunspots has a north magnetic pole on one cycle, and south on the next. The first reversed sunspot appeared July 31, and another followed soon after. This signals that we are beginning the next solar cycle. Sunspot pairs with the old order are expected to disappear over the next few months.

International Space Station – Anousheh Ansari is visiting the International Space Station as a paying space tourist for about a week, arriving aboard a Soyuz spacecraft, scheduled for late September. She has volunteered for several space medicine experiments. The Ansari family sponsored the X-prize, recently won by the first private manned spacecraft to reach space twice. Also aboard the Soyuz are an astronaut and a cosmonaut to replace 2 of the station crew members and stay the next 6 months.

Earth flipped? – True polar wander is a phenomenon in which the surface of a planet drifts with respect to the rotational pole, due to imbalance of surface features. The most massive spot moves near the equator over a period of millions of years. It was proposed for the Earth in the mid 19th century, but has not been seriously considered since plate tectonics was generally accepted, and tectonics could explain observed geological effects of the surface moving. True polar wander is still being seriously considered for

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king at our Anza Site
car or other vehicle)

someone who was smoking in the
a star party, and the circumstances
king" policy at Anza is probably
s not allowed on the Anza site except

was adopted. One of the most
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art of our efforts to reduce the risk of
this policy are: smoke is very bad for
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who might be exposed to second-
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oesn't resolve the situation rather
efforts yourself. If no officer or Board
notify the current president or the
on as possible, providing information
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surrounding circumstances, and leave
on behalf of the club to deal with the
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omply with the policy, and I hope that
norance. If anyone has a question
mail me or ask me about it.

Barbara Toy

(continued from page 3)

So, I have a few questions for all of you that I hope you'll answer for me; you can email me your responses or send them to me care of the club's Post Office Box (see the back of the Sirius Astronomer for the full address), or give them to me wherever you happen to see me. As you can tell by the way these are phrased, I'm looking for some narrative responses here, which I hope will give me more information to work with than getting responses to some kind of multiple choice questionnaire.

1. Are there any astronomy-related activities that you would like to be involved in that are not currently available through OCA? Please describe these activities and, if you know of any club that currently does them, tell me which ones.

2. Are there any activities that you know OCA did in the past, such as working with the Tessmann Planetarium, that you would like the club to get involved with again? If so, what activities, and what kind of involvement would you like the club to have? What involvement would you like to have with these activities yourself?

3. Are there any local institutions or organizations that you would like OCA to build stronger ties to? (Some possible examples would be local Community College districts or individual colleges, Chapman University, UCI, Cal State Fullerton, the Centennial Heritage Museum, the Discovery Center, other local museums, Boy Scouts or similar groups, other local astronomy clubs, other clubs that might have related interests such as the Orange County Space Society, computer or photography clubs) What kind of relationship would you like to see our club have with these? What involvement would you like to have in this yourself?

4. Keeping in mind that the club has no employees and everything that it does is done totally by volunteers, do you have any suggestions for what the club might do to improve its services to its members? What kind of help could you give to achieve this improvement?

Thanks for your help, and I look forward to getting your responses!

Mars and other bodies in our solar system. However, new evidence collected in a remote Norwegian archipelago seems to indicate that a major true polar wander event took place about 800 million years ago. The evidence consists of sediments from that time period showing magnetic fields indicating a movement 10 to 100 times as fast as continental drift. The scientists think they have ruled out other possible explanations of the sediments, but further evidence is needed. Next Australian rock of the same age will be examined for similar evidence.

Chandra (X-ray space telescope) along with radiotelescope data has studied the Sunyaev-Zeldovich effect, in which the radiation of the Cosmic Microwave Background interacts with the electrons in the clouds of gas surrounding clusters of galaxies. Once the properties of the clouds of gas have been measured (which Chandra did), the actual size of gas cloud can be calculated. Then the apparent size is compared to the actual size, yielding the distance to the galaxy cluster, in a method entirely independent of the other methods of measuring distances, such as Cepheid variables and Type Ia supernovas. From this study, which included 38 galaxy clusters up to 9.3 billion light years away, the Hubble Constant was calculated, and the result was 77, plus or minus 15%. This is somewhat larger than the most reliable of the other methods (72), but the imprecision range includes it.

M33 distance – A new method of determining distances to nearby galaxies has been applied to M33, the Triangulum Galaxy. The method uses eclipsing binary stars, whose mass and brightness can be calculated. The distance is then calculated from the apparent brightness. The result was 15% farther than other methods have produced for this galaxy, and the astronomers doing this measurement believe that the precision is plus or minus 6%. If correct, this could seriously disturb the general distance scale used for all galaxies, and change the Hubble Constant to a smaller value. This method will need verification by other astronomers, since it disagrees with nearly all other galactic distance work. Note that the M33 measure says we should make the Hubble Constant smaller, while the Chandra work reported above implies it should be larger, if any change is made.

Cassini (Saturn mission) has imaged ringlets within the planet's rings that have wider and narrower parts. Theory says that any such spots should be smoothed out quickly by ring particle motion. They must be newly generated by some force, but it is unknown.

The July Cassini flyby of Titan (Saturn moon) passed over the north polar area and took radar images through the clouds. Several extremely smooth areas were found that appear to be **lakes of liquid hydrocarbon**, probably methane or ethane. Before the Cassini and Huygens missions, it had been predicted from temperature and composition measurements of the Titan atmosphere that the surface would be covered by methane oceans, but until this radar pass, extremely few candidates for small lakes were all that had been found. It is now believed that the temperature conditions to maintain lakes of methane may occur only in the polar regions.

The previous radar pass was over a region named **Xanadu**, a bright area about the size of Australia. Earth-like features were found, surprising because the chemical composition and cold temperatures of Titan are so unlike Earth. Western Xanadu has large areas of dark sand dunes, giving way to areas of river networks in hills. Eastern Xanadu has more river channels, ending in a dark plain without dunes. Appalachian-sized mountains crisscross the region. There are deeply cut channels and valleys that appear to be earthquake (titanquake?) faults. Xanadu is the only large region of Titan that is not covered by some sort of dirt – it appears to have been washed clean by some process.

Cassini has been looking for the **spokes**, radial lines across parts of the rings, which were seen often in images taken by the Voyager spacecraft. Although some traces of the spokes showed up in a few images of the unlit side of the rings, no spokes had been seen on the sunlit side until now. It is hoped that more spokes will show up, and that scientists can explain when the spokes appear and when they do not.

Titan weather – Study of the Huygens Titan lander data show that there is probably a steady drizzle of methane rain on Titan. It is not voluminous however, amounting to only about 2 inches of rain per (Earth) year. This appears to be enough to keep the ground continuously damp. The clouds that form the rain are low in the atmosphere, since higher clouds produce methane ice instead of liquid. The low clouds consist of both methane and nitrogen.

Titan surface – Study of the Huygens radio signal received by the Cassini spacecraft for 71 minutes after the landing shows that some of the signal was reflected off the surface of Titan, mainly by the ground west of the landing site, up to more than a mile away. The properties of the reflected signal show that the surface there is relatively smooth, but sprinkled with pebbles 2-4 inches across. This agrees with what was seen in images taken by the lander, so says that what we saw is typical of a much larger area.

Exoplanets (planets outside our solar system) – Observations made at the European Southern Observatory (ESO) in Chile have imaged a planet orbiting a body too small and too cool to be a star, or even a brown dwarf. In other words, 2 planets formed, orbiting each other, without any form of star. They are separated by about 4 times Neptune's separation from our Sun, and lie about 400 light-years away in Ophiuchus. Very few exoplanets have ever been directly imaged, and none has ever been found orbiting another planet-sized body. If the soon-to-be-announced official definition of a planet includes the requirement that a planet must orbit a star, then astronomers may need a new way term for planet-sized bodies that don't orbit a star.

More exoplanets – The discovery of many giant planets orbiting other stars has heightened speculation that there are Earth-like worlds in nearby planetary systems. Current methods of planet discovery are not sensitive to planets as small as Earth. Computer simulations of known exoplanets have been made to determine if an Earth-like planet could coexist at the right distance to have temperatures that would sustain life. Of 4 nearby systems, 1 was found to be compatible with such for billions of years. This implies that planets that could sustain life may be fairly common.

Surviving a red giant – The ESO has also discovered a brown dwarf (star too small to sustain hydrogen fusion that normally powers stars) that closely orbits a white dwarf star. The white dwarf had to have already passed through its red giant phase, where the star swells up to gigantic size, and at that time, the brown dwarf had to have been orbiting inside the red giant. The stars now orbit every 2 hours, but calculations show that they had to have started with a much larger and longer period orbit, and the brown dwarf had to have had more mass before the red giant phase of its companion star. Then friction of passing through the outer parts of the red giant would shrink the orbit and steal material off the brown dwarf.

James Van Allen, long a professor at the University of Iowa, died at age 91. He supplied instruments on NASA spacecraft from the very first one (Explorer) through the Galileo mission to Jupiter. Data from Explorer showed that the Earth is surrounded by belts of charge particles, trapped by the magnetic field, and these belts soon after became known as the Van Allen Belts. His later instruments explored the radiation bands about Jupiter and Saturn.

Spitzer (infrared space telescope) has imaged the Orion complex (the Great Orion Nebula and all nearby nebulas) and found nearly 2300 planet-forming disks about stars that recently formed in the complex. About 60% of all the new stars had disks. It is not known why all did not form these disks. About 60% of the new stars were found to have formed in large star clusters, while theory

(continued next page)

ASSISTANCE NEEDED in tracking down telescope donated to OCA in the 1980's by Josephine Webster. The telescope was built by George Webster and is a refractor with hand-ground lenses. If anyone has any information on the condition or wherabouts of this instrument, please contact Donna Zernick at dzernick@thuntek.net

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Pad License for sale: 10x10 pad with a cabinet at its western end, 3 outlets and a pier with a mount plate for an 8" Meade Schmidt Cassegrian. It is on the level directly below the club's observatory.it is the pad nearest the large cargo container, which we have a share of. That share will go along with the pad. There is also a level parking spot delineated by slightly burnt railroad ties, near the pad. Contact Sylvia & Dick Sligar ssligar@att.net or (714) 538-3327

FOR SALE: Meade 14"LX200GPS with UHTC Coatings; Series 4000 Super Plossl 12mm & 26mm Eyepieces; Speed Zero Image Shift Microfocuser; 8 x 50 Viewfinder; 2" diagonal mirror with 1.25" Adapter; Variable-Height Giant Field Tripod; Vibration Isolation Pads; JMI Telescope Carrying Case for Meade 14"LX200; Meade Superwedge; Losmandy dovetail plate for 14" LX200; #777 Off-axis guider; Scope Stuff Balance System; AC adapter for 12 VDC Power from 120 VAC; 12 VDC Power Cord; EZ Balance On-Axis Counterweight; Ergonomic Handles One Pair. Equipment in excellent condition. Complete system $4,900. Contact Rick Brown 714-418-0872

had predicted about 90%. Also found were 200 stellar embryos, still in the process of forming a star, most of which had not been observed before. Infrared can penetrate dusty areas that cannot be seen in visible light, and Spitzer has the best resolution of any infrared space telescope, so that's why so many new objects were discovered.

Spitzer also found evidence that dusty **disks** of planet-forming material slow down the rotations of the stars that they surround. Typical newly-formed stars rotate in half an Earth day or less, but older stars generally rotate much more slowly. Before stars fully form, they tend to rotate even faster than new stars, in fact so fast that theoretically they should never finish contracting into a star. But stars do form, so something slows them down. Scientists had theorized that the disks could help slow the rotation, but had little evidence. Spitzer observed 500 young stars, both fast and slow spinners. The slow spinners were found 5 times more likely to have a dust disk, so the disks are probably involved in the slowing. Stellar winds and planets are thought to slow rotation, so further work is needed to determine their contributions. Essentially all known planets orbit stars that rotate slowly, so planets are probably involved too, though there may be a selection effect there (searches for planets tend to look only at Sun-like stars, which rotate slowly).

Star Formation – For some time it has been predicted that a molecular cloud in the process of collapsing to form a new star, should interact with magnetic fields to produce an hourglass shape in the magnetic field. For the first time such a shape has been conclusively found in observations made with the Submillimeter Array (of very high frequency radiotelescopes). It was found in the Perseus Molecular Complex about 980 light-years away. The magnetic field was measured by its polarization effects on the radio waves emitted. The data appear to support the theory that magnetic fields control the speed of collapse, rather than the competing theory that turbulence controls it.

Neutron star hot spots – Pulsars are the rotating neutron stars left after certain sizes of stars explode in supernovas. They appear to pulse (hence the name pulsar) for the same reason a rotating light in a lighthouse appears to pulse. XMM Newton (X-ray space telescope) has studied old pulsars, up to a few million years old. Observations found that not enough emission of X-rays was occurring from the hot spots near the poles of the pulsars, compared to that observed from young pulsars. Theory said that the hot spots, observed on most pulsars, were caused by charged particles following the magnetic field lines down to the polar areas of a pulsar's surface and colliding. If this theory were correct, then old pulsars should have nearly as much hot spot radiation as new pulsars. So a new theory is needed. The best one found so far is that heat rises from inside a pulsar to form the hot spots, and the heat rises mainly at the magnetic poles. Old pulsars are known to have less internal heat than new ones, so this theory fits.

Nova – In February the star RS Ophiuchi was seen to explode as a nova, raising it temporarily to naked-eye visibility. The outburst was observed by multiple ground- and space-based telescopes at multiple wavelengths. It was thought such novas would explode spherically, but 2 opposing jets were seen, and a possible ring-like structure. The star is known to be a white dwarf star with a companion orbiting closely, which dumps matter onto the white dwarf. The mass of the white dwarf was measured, and found to be near the limit, which if exceeded produces a supernova. So eventually (but not soon in human terms) it is expected that so much matter will accumulate on the star that it becomes a Type Ia supernova, which will be a whole lot more spectacular than a mere nova. It is about 5000 light-years away, over 30 times closer than the nearest supernova seen in our lifetimes. Studying how such stars build up to the supernova stage should help our understanding of them.

Red giants – Using the Infrared-Optical Telescope Array (IOTA) in Arizona (3 telescopes used as an interferometer, which greatly improves resolution), astronomers observed 56 red giant stars, including many Mira-type variables. Nearly a third of those surveyed were not uniformly bright across their face, but were patchy. These patches were probably caused by star spots (similar to

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sunspots) or shockwaves generated by pulsating envelopes or possibly planets. Ironically, the IOTA telescope array was shut down since the observations for budget reasons.

Mars' surface – A new study combining lab experiments with observations of Earth's dust storms has concluded that the planet-wide dust storms often observed on Mars should generate static electricity that creates corrosive chemicals, including hydrogen peroxide, as snow that falls and coats the surface. The Viking spacecraft that tried to detect microscopic life on Mars back in the 1970s produced results that were eventually attributed to corrosive chemicals on the surface, rather than life. But until now, there had been no explanation of how sufficient corrosive chemicals could have been produced. This much hydrogen peroxide should also accelerate the loss of methane from the atmosphere.

Large filaments of galaxies – The Subaru and Keck Telescopes in Hawaii have found a filament of galaxies stretching 200 million light years, one of the largest structures known in the Universe. It is so distant that the light we are seeing left there when the Universe was only 2 billion years old. Theory had not predicted such large structures would form that early. It is probably a precursor to the superclusters of galaxies, which are believed to have formed later. There are several theories to explain what makes the gas clouds glow about such filaments of galaxies. The new data supports the theory that galactic winds heat up those clouds, and that supernovas from early generations of massive stars create the winds.

Proxima Centauri – Alpha Centauri, a triple star, has long been known to be the nearest star system to our Sun. The nearest of the 3 stars is known as Proxima Centauri. Several years ago, measurements of the masses and motions of the triple indicated that Proxima might actually not be orbiting the other 2 stars. A new study of the best data on the system shows that if Proxima is near its maximum distance, and has an eccentric orbit, then it is indeed orbiting the other 2. However, the orbit takes so long, we haven't seen enough orbit in the past century or so to know exactly what the orbital motion is. So at this point, the best we can say is that Alpha Centauri is maybe a triple that includes Proxima.

Instant AstroSpace Updates

NASA has selected the SpaceX and Rocketplane-Kistler companies to develop vehicles for **commercial transport** of people and cargo **to orbit** (like airline service to space). 20 companies had applied for the contract.

Smart 1 (European lunar mission) smashed into the Moon as predicted the evening of September 2 (PDT), producing a flash imaged by a few amateurs, and raising a dust cloud imaged by the CFHT telescope in Hawaii.

Study of infrared spectra of asteroid Itokawa taken by the Japanese spacecraft Hayabusa of disturbed and undisturbed spots have quantified how exposure to space changes the chemical composition of the surface over millions of years, a process known as **space weathering**. This process is believed to explain why meteorites do not have the same spectra as asteroids, even though they are believed to be pieces of asteroids.

The Crew Exploration Vehicle being developed to take astronauts into and back from space after the Shuttles are retired has been named **Orion**. The rocket that will lift this vehicle was named Ares I in a previous NASA announcement.

A new study of the Earth's **ozone** shows that it is recovering a little faster than predicted, except at the southern ozone hole, apparently as a result of discontinuing use of chlorofluorocarbons. It will still take about half a century to return to original ozone levels.

HST has imaged one of the smallest objects ever seen orbiting an ordinary star (a red dwarf in this case). Its mass has been calculated at 12 times that of Jupiter, which puts it near the dividing line between a planet and a brown dwarf, so more study is needed to determine what it is.

The **Space Shuttle** Atlantis launched on the last day of its current launch window (due to weather and mechanical delays) and successfully reached the International Space Station, carrying trusses (girder-like structures that connect station parts) and solar panels to expand the station, doubling the electrical power capacity. This is the first station construction since late 2002.

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