# SIRIUS ASTRONOMER

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The Newsletter of the Orange County Astronomers

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*The planet Mars reaches opposition this month! Be sure to see our new contest on page 5 for the best OCA Mars photograph! (photo credit: Bill Hall)*

## OCA CLUB MEETING

The free and open club meeting will be held Friday, October 14th 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. Nic Richmond of the Scripps Institute of Oceanography, who will be speaking on 'Paleomagnetism of the Moon and Mars'

NEXT GENERAL MEETING:

November 11th

## STAR PARTIES

The Anza star party is on October 1st and October 29th. The Black Star Canyon site will be open this month on October 22th. 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 7th (and next month on November 4th) at the Centennial Heritage Museum at 3101 West Harvard Street in Santa Ana.
GOTO SIG: TBA (contact coordinator for details)
Astrophysics SIG: Oct. 21st, Nov. 18th
Astro-Imagers SIG: Oct. 18th, Nov. 15th
EOA SIG: Oct . 24th, Nov. 28th
Dark Sky SIG: TBA (contact coordinator for details)

# AROUND OCA

## By Barbara Toy

As I write this, Hurricane Katrina hit the Gulf Coast only three weeks ago, and the devastation in Louisiana and Mississippi is still fresh in our minds. I'm sure I'm not the only member of the club with friends or family in that area – I hope all of your loved ones are safe, at least. If they are among the many people displaced by the Katrina and its aftermath, I hope they find their losses are not too great and that they are (or were) able to return home quickly. Sadly, there are many people who no longer have homes to return to, and many more who may wait weeks or even months before they know if their homes are habitable. Although our club isn't well-suited to collecting donations for the relief efforts, there are many organizations that are, and I hope you will use those channels for donations to help the unfortunate people whose lives were so disrupted by Katrina.

One of my best friends is on the faculty of the Tulane Medical School and has lived in New Orleans for almost twenty years – having friends there has been a great way for me to see the city beyond the usual tourist haunts. She happened to fly into Orange County the night of the Astrophysics meeting in August, and I brought her to the meeting after picking her up at the airport, in time for most of the second video and some discussion. While she was out here for a conference back in 2002, I convinced her to go to a star party at Anza and to go out there again for the big Leonid meteor shower, and she enjoyed these experiences enough that she's more enthusiastic about my hobby than most of my other non-astronomy friends and relations. At any rate, Cass was a good sport about going with me to the Astrophysics meeting and said she found it interesting, even though, after seeing him on the video, it seemed her main interest was in examining Professor Wolfson's brain to see how he could process his ideas and talk so fast at such length (her research area is the primate brain).

Cass's husband and daughter have now joined her here, while they wait to find out when (or if) they can return home. While they're trying to sort out their lives and establish some level of normalcy, I keep offering various club activities as diversions. They're hoping to make it out to Anza for at least one star party before they head south again (which may be to Texas, where Tulane seems to be setting up temporary quarters) – if you were out at Anza for the October star party, maybe you saw them there. Assuming that star party isn't clouded out (given our record this last summer, that's not a foregone conclusion, unfortunately), if they're able to attend that party, I know they'll be made welcome.

In fact, this seems like a good time to thank all of you great club members who go out of your way to make newcomers and guests feel welcome and at home at Anza and at other club events – as the club's Member Liaison, thank you all very much!

**In Case of Emergency…**

If nothing else, what happened with Katrina drove home the fact that everyone should have some kind of plan in case of disaster, including those of us who spend time out at the club's Anza site. Cellphone coverage at Anza is spotty for most phones, and, in case you need to be contacted about an emergency while out there, you should make sure that your family or close friends have the phone numbers to the club observatory (951/763-5152) and Anza House (951/763-9693), and that they know that they can find these and the numbers for club officers and other contact people in the "Contacts" section of the website or on the back of each issue of the Sirius Astronomer.

If you have an emergency while on the Anza site and need to summon help, the phone at Anza House is usually on one of the tables in the western living room (it has a long cord and tends to migrate), and the club observatory has phones on the counter at the back of the warming room and on the Kuhn Control Center computer desk in the observing area.

We haven't yet been faced with conditions where people needed to get away from our Anza site and the main road out was closed, but it could happen. Particularly for people who are out at Anza a lot, it would be a good idea to look at a map showing the roads around the site to get an idea of some other routes out, and to take some time to explore the surrounding areas and become familiar with them before there's an emergency. Even though I know that's a good idea, I have to admit that I haven't done nearly as much exploration out there as I've intended to, as it always seems there's so much to do on our site and not enough time to go wandering around the local by-ways…

On the more general side, the California Office of Emergency Services has a lot of helpful information and suggestions for what to do to be prepared for disaster conditions: See www.oes.ca.gov, specifically the link titled "Be Smart. Be Responsible. Be Prepared. Be Ready." This includes links to information from the Red Cross and other helpful sites. They repeatedly recommend that you have enough food, water and other supplies to take care of yourself and your family for at least three days. As we saw with New Orleans, in a major disaster it may take even more than three days for outside help to arrive.

Now, on somewhat less weighty topics:

**Labor Day Weekend – OCA Style…**

Running somewhat against conventional wisdom, the club had some significant scheduled events over Labor Day weekend. The first of these was our Beginners Class, which meets regularly on the first Friday of the month – this, of course, put it right at the beginning of that holiday weekend. We would like to thank the Orange County Register for its regular notices about the class, which has certainly caused a lot of people to come to the Beginners Class over the last couple years. However, the notice for the September class had a small mistake, identifying this as a session when people were to bring their telescopes to get help in setting up and learning how to use them. I found out about this when I started getting calls – there were obviously a lot of people out there who wanted some hands-on help in using their telescopes, which was great but not what we were intending to do in that session. I hated to tell them to wait until January,

which is the next regular Telescope session, so I ended up telling the people who called me to bring their scopes and we'd do what we could to help them – and then I put out calls for help through various channels in the club.

I'm deeply grateful to the volunteers who turned out on short notice and in spite of it being a holiday weekend – the Stanns, Matt Ota, Steve Short, Liam Kennedy, Craig Bobchin and Mike Bertin (and I have this haunting sense I'm forgetting someone – my apologies if I did!). We did have a number of people who brought telescopes, and some others who didn't bring their scopes but wanted some one-on-one advice about them anyway. Most wound up attending the regular class session as well, conducted by Dave Pearson – we had more than thirty people in the classroom following his presentation very intently, including several children. It proved to be a very productive and enjoyable evening for all concerned, with the auxiliary benefit of giving us club members a chance to catch up with what different people are doing and to socialize a bit (outreaches and SIG meetings are great for this!).

The next night was our Anza Star Party, which featured better viewing conditions than most of our star parties over the summer, and was one of the best attended parties of the summer. I don't know the total number of people on site, but the Football Field was full, and it seemed that most of the pads on the other levels were also in use. Tom Munnecke helped me run the observatory, and made the 10-inch LX200 his main project for the evening, which meant that we had objects in both telescopes to show people who came to the observatory. We had quite a few visitors, which is always nice, but we also had some periods when we could use the telescopes for our own pleasure – and I'd be telling a distinct untruth if I said we didn't enjoy those times as well!

**The Club Observatory:**

The September star party was also notable for the achievements of the work crew that showed up to start making the repairs needed so the current observatory roof can make it safely through the next rainy season. When I arrived in mid-afternoon with paint, screws and other supplies, Bob Buchheim, Tom Munnecke and Ray Stann were hard at work, and had already replaced the splintered braces on the structure that supports the roof when it's open and scraped or wire brushed a lot of the flaking paint off of the support structure. By the end of the afternoon, they'd put reinforcing screws into the east and west sides of the roof, caulked it, and, with the additional help of John Castillo and Don Lynn, gotten a coat of primer on most of the support structure. Don also re-tensioned the cross-wires on the inside of the roof. Don's contribution to this effort was after he'd already put in several hours of work elsewhere on the site, and Bob made a special trip to Anza just to work on the observatory.

Whether because of the retensioning of the cross-wires or the reinforcements with the screws, or both, the roof now opens and closes with a lot less creaking and squealing than before, so there is already noticeable improvement from that day's work. As I write this, we still need to do the repairs and prep work on the north and south sides of the roof structure itself as well as the south roof flap, finish the priming, paint all of the woodwork, and repair and seal the stucco wall. Hopefully, by the time you read this, all or most of this work will be done – but, if you want to help with what's left, we'd be delighted!

My heartfelt thanks to Bob, Tom, Ray, John, and Don for all their help!

**Update on the Kuhn:**

Since we're talking about the observatory, here's what's been happening with our much-loved Kuhn telescope: Dave Radosevich, who did the major reconditioning of the Kuhn about three years ago, was going to clean, lubricate and adjust the gears on the day after the September star party, showing me how to do this in the process. However, when he looked more closely at the gears, he realized that at least one of the bearings was out of position and that he needed to do more disassembly than he'd expected. This was going to take more time than he could spare that day, as he was leaving on an out-of-state trip, and he therefore postponed the job to the October star party. We're hoping that, when this work is done and the gears are all properly adjusted, we'll have a lot less backlash and the Kuhn will be more responsive to its controls.

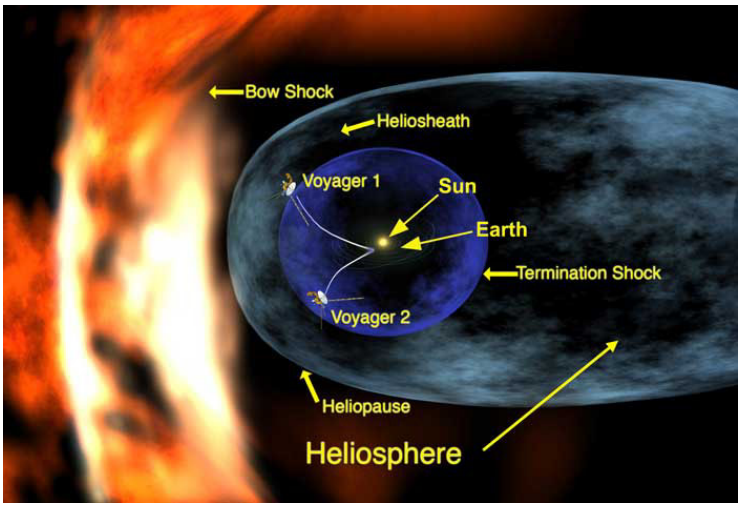
While we were looking at the gears, we noticed that the outside of the Kuhn was getting pretty grimy again – due, I expect, to the combination of dust and the high humidity that's been the hallmark of our summer out there. I therefore spent a good part of Sunday cleaning the outside dirt off of the Kuhn (it's now a couple shades lighter than before), and trying to figure out the best way of cleaning the primary mirror without taking it out of the telescope. If anyone has any experience in that area and is willing to lend a hand with this, please let me know.

**In Closing…**

We have a lot of talented and energetic people in this club, and there are a lot of different things people can do to help keep the club going – as you can see from the varied activities of the volunteers mentioned above. As a few examples of our ongoing needs: Anza House needs cleaning on a regular basis and could use a lot of repairs, and our Anza House Coordinator, Tim Hunt, can't do it all himself; there are always weeds to be cut down, bushes to trim and other site cleanup to be done out at Anza, especially around Anza House, the club observatory, and other general use area; Karen Schnabel can always use more people for her list of substitute librarians for when she can't make it to a meeting as well as people to help her handle the library during the general meetings; Leonard Stein often can use some help with refreshments at the meetings – there are a lot of continuing needs as well as special projects such as the observatory roof repairs/replacement, pulling the fiber optic cable for the Anza site network, and repairs to the Weathercam assembly. Besides responding to specific calls for assistance, please keep an eye out for anything that needs to be done and lend a hand wherever you see a need, even if nobody is specifically recruiting for help – we'll all benefit, and you'll find that the warm feeling you get from helping out really does improve your club experience!

# Where No Spacecraft Has Gone Before

by Dr. Tony Phillips




*Voyager 1, after 28 years of travel, has reached the heliosheath of our solar system.*

In 1977, Voyager 1 left our planet. Its mission: to visit Jupiter and Saturn and to study their moons. The flybys were an enormous success. Voyager 1 discovered active volcanoes on Io, found evidence for submerged oceans on Europa, and photographed dark rings around Jupiter itself. Later, the spacecraft buzzed Saturn's moon Titan—alerting astronomers that it was a very strange place indeed! —and flew behind Saturn's rings, seeing what was hidden from Earth.

Beyond Saturn, Neptune and Uranus beckoned, but Voyager 1's planet-tour ended there. Saturn's gravity seized Voyager 1 and slingshot it into deep space. Voyager 1 was heading for the stars—just as NASA had planned.

Now, in 2005, the spacecraft is nine billion miles (96 astronomical units) from the Sun, and it has entered a strange region of space no ship has ever visited before.

"We call this region 'the heliosheath.' It's where the solar wind piles up against the interstellar medium at the outer edge of our solar system," says Ed Stone, project scientist for the Voyager mission at the Jet Propulsion Laboratory.

Out in the Milky Way, where Voyager 1 is trying to go, the "empty space" between stars is not really empty. It's filled with clouds of gas and dust. The wind from the Sun blows a gigantic bubble in this cloudy "interstellar medium." All nine planets from Mercury to Pluto fit comfortably inside. The heliosheath is, essentially, the bubble's skin.

"The heliosheath is different from any other place we've been," says Stone. Near the Sun, the solar wind moves at a million miles per hour. At the heliosheath, the solar wind slows eventually to a dead stop. The slowing wind becomes denser, more turbulent, and its magnetic field—a remnant of the sun's own magnetism—grows stronger.

So far from Earth, this turbulent magnetic gas is curiously important to human life. "The heliosheath is a shield against galactic cosmic rays," explains Stone. Subatomic particles blasted in our direction by distant supernovas and black holes are deflected by the heliosheath, protecting the inner solar system from much deadly radiation.

Voyager 1 is exploring this shield for the first time. "We'll remain inside the heliosheath for 8 to 10 years," predicts Stone, "then we'll break through, finally reaching interstellar space."

What's out there? Stay tuned…

For more about the twin Voyager spacecraft, visit voyager.jpl.nasa.gov. Kids can learn about Voyager 1 and 2 and their grand tour of the outer planets at spaceplace.nasa.gov/en/kids/vgr_fact3.shtml .

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

# Empire of the Stars

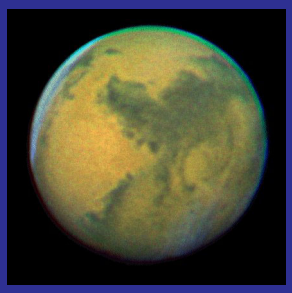
A Book Review by Gordon Pattison

*Empire of the Stars: Obsession, Friendship, and Betrayal in the Quest for Black Holes* (2005) by Arthur J. Miller is a superb book that covers important discoveries in the history of astrophysics, and is both the detailed biography of Subramanyan Chandrasekhar and the history of the search for black holes. This book is long overdue because it fully explains why Eddington blasted Chandra's discoveries that related to the ultimate fate of the universe.

At that time, in 1935, Eddington was the leading astrophysicist of the entire world and Chandra was just a black Indian graduate student at Cambridge. Eddington had just spent seven years trying to develop the fundamental theory that would explain everything in the universe, and he saw that Chandra's historic paper explaining the mass limit for white dwarf stars exploded his seven years of work. He was probably also insecure and fearful of being toppled from his throne, which he was in later years by his own sloppy research.

Eddington simply could not conceive of anything absolutely disappearing into nothing, and said, "I think there should be a law of Nature to prevent a star from behaving in this absurd way." His prestige at the time was such that Chandra was forced to drop his study of the life of white dwarfs, and astrophysics was denied this important work for many years. As late as the 1960's, astronomers were content to assume that most stars turned into white dwarfs when they died, while the rest simply blew themselves up. Today, Eddington is largely forgotten and our well-named Chandra X-Ray Telescope is making important discoveries every day.

Arthur J. Miller is a professor of the history and philosophy of science at University College, London. He interviewed Chandra, Lalitha (Chandra's widow), Chandra's relations in India, and Chandra's fellow scientists and his many graduate students, so for the first time we have a complete study of Chandra's life and work. The author turns over many rocks to explain the underside of the scientific world, where the rule too often has been: "Don't stick your head out or it could be cut off." The Orange County Library has a copy of this book.



**OCA Mars Photo Contest**

- **OCA Member's Images Only**
- **All photos taken after 10/14/2005**
- **JPEG files only, not to exceed 500KB**
- **Email images to jimbenet@pacbell.net**
- **Images must be received by 11/15/2005**
- **Awards: 1st = $50, 2nd = $30, 3rd = $20**
- **Winners will be announced 12/9/2005**

# ASTROSPACE UPDATE

October 2005

Gathered by Don Lynn from NASA and other sources

To find out more on these topics, or those of past months' columns, through the World Wide Web, send your Web browser to our OCA Web site (http://www.ocastronomers.org), select Space Update Online, and the topics are there to click on.

**Water on Mars** – A team of scientists studied the gullies appearing in images from the Mars Global Surveyor and modeled how they could have formed with computer programs. Their conclusion is that the gullies could form from discharges of liquid water from below ground, even with the low temperatures and atmospheric pressures found on Mars today. Liquid water emerging into those conditions freezes and/or evaporates quite quickly. Mars is thought to have been warmer and had higher pressure in the past, perhaps billions of years ago, so some scientists have claimed all the major erosion by water had to have happened in that past. The new study showed that water in today's conditions would remain liquid long enough to erode gullies of the size seen, but not much longer. In fact the scarcity of debris below the gullies supports the new study, as it shows that much debris would not fully spread out below the gullies by the time the water was lost to freezing and evaporation.

**Mars Express** has found 50 to 100 volcanic cones near the north pole of Mars that have no impact craters on them. This would imply that the lava flowed from them in the last 1-3 million years. The implication is that some of them could still be active volcanoes. This supports a recent similar finding for uncratered lava flows in the Tharsis region of Mars. Up until recently, it had been thought by most authorities that Mars had cooled sufficiently long ago (perhaps billions of years ago) to stop all volcanic activity on the planet.

**Mars rover Spirit** reached in late August the highest point in the Columbia Hills, almost 300 feet above the surrounding plain. The high vantage point allows the most spectacular panoramic views of Gusev Crater, the 100 mile diameter impact crater in which the rover landed. The first images released showed the rim of Thira Crater, which is 15 miles across, and had been hidden from Spirit by the hills until now. The rover has slowed down a bit in the 21 months it has been exploring, but is still in excellent condition. The radioactive source in the Mossbauer instrument has decayed substantially, slowing spectrometer readings of iron minerals, and the RAT (Rock Abrasion Tool) has worn out its cutting edge, though its wire brush still operates. The rover recently passed the 3-mile mark in its travels, and is approaching 60,000 images taken. A plan is being developed to visit the most geologically interesting sites visible, which will be executed after an extensive study of the rocks atop Husband Hill and imaging of everything in sight.

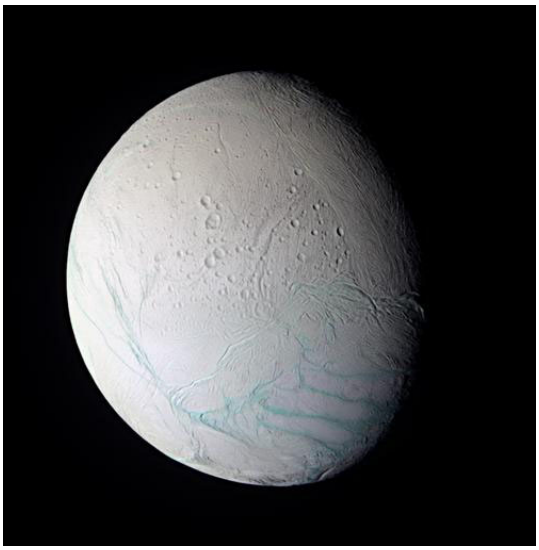
**Sun shining** – A long-standing question among theorists is whether the Sun developed far enough to shine before or after our planetary system formed. A study using a new technique involving sulfur isotopes showed that the meteorites studied were struck by solar wind and ultraviolet light during their formation. So the answer is "before". This will have to be taken into account in all computer models of how planets and asteroids form, and should substantially affect the resulting composition, since sunlight and solar wind chemically change the building blocks of the planetary system.

**Massive star disks** – Two groups of astronomers, using different methods on different stars, have announced the detection of a disk of gas and dust out of which a very large star is forming. Many theorists had been claiming that large stars form by merging of small stars, and had generally been unable to make computer models of the small-star formation method (collapse of a disk) work for large stars. These observations send many theorists back to work out a better theory. One group used observations of polarized infrared light with adaptive optics on the Subaru Telescope in Hawaii to detect the disk about a star 7 times the mass of the Sun. The other group used the Submillimeter Array Telescope, a short walk away from the Subaru, to detect a disk and measure its rotation about a forming star with 15 solar masses. The largest previously known star forming in a disk was only 2 or 3 solar masses. Follow-up observations with a radiotelescope also found jets of gas being thrown out of the larger star. Disks often have jets flowing out from their poles.

**Cassini** (Saturn mission) has detected a very thin atmosphere of mostly oxygen around the rings themselves, unconnected with the atmosphere of the planet or moons. Jupiter's moons Europa and Ganymede have a similar thin atmosphere, probably for the same reason. It appears that ultraviolet light from the Sun is knocking apart water ice molecules into hydrogen and oxygen, and then the hydrogen escapes because it is lighter. The oxygen escapes eventually, but it gets replaced as fast as it dissipates.

Extremely high contrast images have been taken of the rings to try to detect the "**spoke**" features seen by Voyager and by the Hubble Space Telescope. No spokes were seen. One theory is that it requires a low angle of sunlight on the rings to show the spokes. If this is true, then the spokes should be seen in a few Earth years when the season changes on Saturn, resulting in a lower Sun angle. Summer on Saturn is over 7 Earth years long.

The "tiger stripes" seen on Saturn's moon **Enceladus** a few months ago have since been imaged more closely and, as reported here last month, were found to be cracks in the surface ice that appeared to be geysering water. Further observations showed that the water was crystallizing as fresh ice about the cracks. Such ice ages over periods of years due to the Sun's radiation and changes form to amorphous ice. Study of the ice deposits



*Enceladus w/south polar ice deposits (NASA/JPL)*

about the cracks shows that much of it was deposited between 10 and 1000 years ago. Simple carbon-based compounds have also been detected around the cracks. The detection of ice and dust at the spacecraft during the flyby did not quite correlate with the times of passing over the stripes, so more work is needed to understand those observations. Cassini will next fly close to Enceladus in March 2008. By chance, the Voyager spacecraft did not see the side of Enceladus with the stripes during their flybys in 1980-81.

Cassini's study of the **rings** over the past several months has produced these results: a number of clumps and knots have been found in the F ring. These could actually be tiny moons, so they will be watched to see if they dissipate as a clump would, but a moon would not. Some very faint wisps of F ring were found to form a spiral rather than a ring. Density and bending waves, common in the A and B rings, move across the rings because of gravitational effects between the ring particles, but the spiral waves in the F ring move by another cause: something, perhaps a moon crossing the F ring, knocks some particles out of the main ring, and then different orbital speeds spread the particles into a spiral. Some of the F ring clumps appear to be in slightly eccentric orbits that cause them to cross the main body of the F ring. The sub-rings within the D ring have moved as much as 120 miles and have dimmed since Voyager imaged them 25 years ago. The G ring contains bright segments that resemble those found around Neptune. Theories explaining these segments include that a nearby moon causes them or that a recent meteoroid impact formed them. The D and G rings contain very little material, and the icy particles in them are the size of dust or smoke particles. By measuring the temperature distribution of ring particles, the rotation rates of the individual particles can be determined (the slower they rotate, the hotter the Sun-facing side gets). Particles in the A, B, and C rings (the easily seen ones) are rotating more slowly than theory of ring particle collision predicts. This implies that the ring particles are softer than thought, so that collisions have less effect on their spin. Ultraviolet images show particles in the A ring collect into clusters that, with time, dissipate and then reassemble elsewhere. The clusters range in size from that of a car to a truck.

Scientists have developed a method using Cassini to image **clouds** as much as about 20 miles below the top layer of clouds, by seeing how the lower clouds block the view of infrared being emitted by the heat deep within the planet. The resulting observations show different types of clouds and different wind speeds at different depths. There seem to be more isolated localized cloud features at greater depths, rather than the huge storms and bands seen in the top clouds. The winds deeper blow as much as 170 mph faster than those at the top clouds.

**Swift** (gamma-ray burst satellite) has observed dozens of supernova and hypernova explosions during their first minutes, and found quite a lot of activity that was not expected from theory. A black hole forms immediately. The new observations show both material falling into the black hole and material being thrown away from it. From 2 to 4 explosions are seen in various wavelengths of light during the first few minutes, where only one explosion was expected. For example, an object seen May 2 showed a very powerful explosion in X-rays about 500 seconds after the explosion in gamma rays. Swift is the first satellite that automatically finds and starts observing as soon as it detects a gamma-ray burst (GRB).

Swift detected a GRB on September 4 that lasted over 3 minutes, quite long for a GRB. When ground-based telescopes measured the redshift of the afterglow, it was found to be so distant that the light from the burst had been traveling toward us for over 93% of the age of the Universe, making it by far the **most distant GRB** known. It is nearly as distant as the farthest known quasar. It is important to find the most distant GRBs, because this will tell us when the first supernovas occurred, which tells us when the first massive stars formed. There is considerable debate over how much time passed after the Big Bang before stars formed.

**Spitzer** (infrared space telescope) has completed the most comprehensive study of the shape of our Milky Way galaxy. It surveyed 30 million stars, many of which are not seen in visible light due to the dust blocking our view. This survey showed the best evidence yet for the long-suspected bar across the galactic center. It was clearly shown to be a bar, not any of the other possible shapes, to be 27,000 light years long (longer than thought), and oriented at about a 45-degree angle to our line of sight from the Sun's neighborhood.

Spitzer also made a study of 55 **asteroids** with orbits that are more characteristic of **comets** (high inclination or eccentricity) than of asteroids. It has long been conjectured that these might simply be comets so old that they have lost their volatile constituents, so can no longer produce comet heads and tails when heated. Surfaces of comets and asteroids differ considerably in infrared light, so the study was designed to test this conjecture. Most of the objects observed in the Spitzer study appear to be asteroids, but a few have surface composition and texture characteristic of comets. So the answer is that the conjecture is sometimes right.

Spitzer was also used to observe dusty rings about 2 very young stars, which were found to have sharp-edged gaps in the rings. The gaps are too small to resolve, but they show up in the infrared spectrum as gaps at certain temperatures. The star heats the dust, more strongly the nearer, so that dust temperature relates to the distance from the star. Each gap is most likely caused by a gas-giant planet that has formed and swept clear a ring within the dust. The gap at one of the stars (GM Aurigae) is at about the distance from the star that the gas giants lie in our solar system. The stars are quite young, only about a million years old, which presents a problem for many theorists who claim that **formation of planets**, particularly gas giants, takes much longer than a million years.

**Dusty old star** – Observations with the Gemini North Telescope in Hawaii have found considerable dust about a very old star (a white dwarf). Radiation and gravity should long since have dissipated such dust, unless the dust was created relatively recently. The most likely explanation is that an asteroid or planet was ground up into dust, perhaps by collision. The particular white dwarf has by far the most metals in its atmosphere of any known white dwarf. It is not known if the high metal content and the dust are related. Only one other white dwarf has ever been found to have dust about it, and that instance had about 100 times less dust than the new discovery.

**Star ages** - A comprehensive survey of more than 4000 elliptical and lenticular galaxies in 93 nearby galaxy clusters has found that the largest of those galaxies consist almost entirely of very old stars, with little evidence of more recent star formation, while smaller galaxies contain substantial numbers of younger stars. This means that star formation in large galaxies shut down early in the history of the Universe, while star formation in small galaxies continued. The observations do not fit well with the theory

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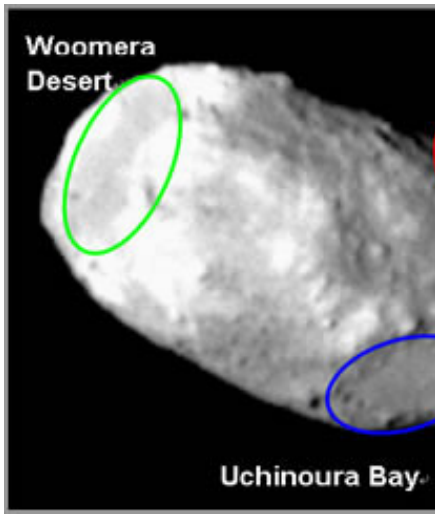
that large galaxies form by consuming small galaxies; if this were true, the large galaxies would contain the newer stars that formed in the small galaxies that were consumed. The survey is believed to be representative of the elliptical and lenticular galaxies in the billion-light-year neighborhood about us.

**Permian Extinction** – Scientists using a new computer model of the oceans and atmosphere have shown that the huge amount of carbon dioxide and sulfur dioxide given off by massive volcanic action would have been sufficient to cause the enormous extinction that is known by the fossil record to have occurred 251 million years ago, at the end of the Permian Era. Over 90% of ocean species and about 70% of land species went extinct at that time, which was even more devastating than the later extinction that included the dinosaurs, about 65 million years ago. The new study showed that the oceans warmed considerably due to the greenhouse effect of the volcanic gases in the atmosphere. The ocean warming changed the ocean circulation so that huge layers of water never reached the surface to be oxygenated and pick up surface nutrients. The lack of oxygen throughout much of the depths of the oceans was what killed most the ocean life. When much of the ocean life died, an upset occurred in the balance of that life consuming carbon dioxide as fast as volcanoes and animals produced it, which led to a further rise in carbon dioxide levels. That caused a further rise in temperature, which was what killed most of the land life. The computer model produced increases in ocean temperature and salinity that matched that implied in the fossil record, so the scientists who made the study believe that they now correctly understand the conditions during the Permian extinction.

**Asteroid near miss** – Now that the flap is over about whether the asteroid 2004 MN4 (recently named Apophis) will hit or miss the Earth on April 13, 2029, scientists are thinking about what this close call will mean to science. It will be so close (about 3 Earth diameters) that it will be like a free spacecraft mission, but the spacecraft will be Earth and all its observatories. Scientists have calculated that tidal forces will bend the asteroid, so observing that should tell us what the interior properties are. It has been suggested that we should place seismometers on the surface of Apophis before the flyby in order to measure precisely this bending and the shocks that it produces. The asteroid is only about 300 yards long, but should be visible to the naked eye from Europe, Africa and western Asia for a short time on the night of the flyby. Take that into account when you make your vacation plans for 2029.

**Young chondrules** – Radioactive measurement of the ages of chondrules (the small grains of minerals found in many meteorites) in 2 meteorites showed that they are younger than other chondrules. The previous chondrule ages showed that meteorites were formed at the time the planets were, about 4.5 billion years ago. It has been generally agreed that the chondrules formed when shock waves hit the material in a disk about the Sun at the time that planets and asteroids were forming. The minerals in the new study did not appear to have been formed by a shock wave. The conclusion from the new study is that some chondrules were formed after the others, by collisions of asteroids or planets that occurred somewhat later than the original formation.

**Speeding pulsar** – Observations with the Very Long Baseline Array radiotelescope have measured the distance and speed of several pulsars, and one of them was found to be traveling faster (670 miles per second) than any other known pulsar. Theorists thought they understood how a supernova could occur asymmetrically and cause the resulting pulsar to be blasted out at high speed, but this pulsar is moving faster than current theory supports. The speed exceeds the escape velocity of the Milky Way, so it will leave the galaxy. The path was traced back to a cluster of huge stars in Cygnus, from which it must have been ejected 2.5 million years ago. The pulsar has moved across a third of our sky in that time.



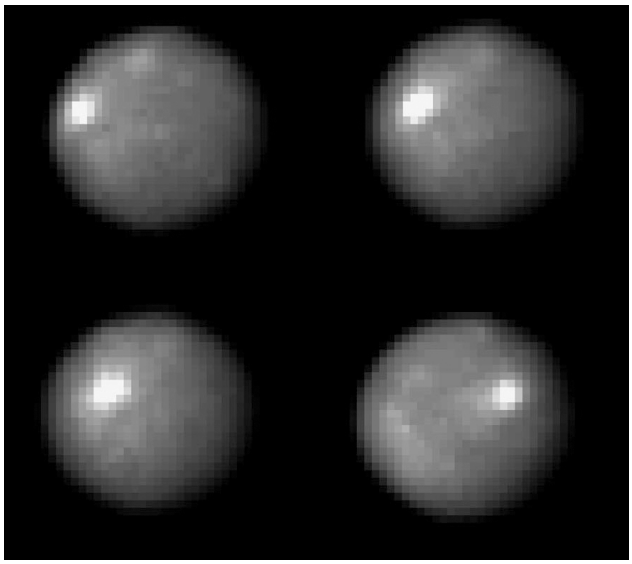
*25143 Itokawa (JAXA)*

**Deep Impact** (comet collision mission) – Results from studying the July impact with Comet Tempel 1 include: The comet has a very fluffy structure, weaker than a bank of powder snow. The dust of the comet is held together by gravity. Craters that appear to be from impacts were seen, yet no impact craters were seen on the previous 2 comets imaged closely. A huge increase in carbon-containing molecules was detected in the ejected material. Such material could have been brought to Earth early in its history when comet impacts were common. The comet is quite porous, which results in its conducting heat very poorly. This would imply that the interior has never been heated, and would be material preserved since the comet formed. Water vapor that had been boiled by the impact was observed, quickly followed by ice that was ejected from below the surface, still frozen.

**Spitzer** was watching the Deep Impact in infrared, with these initial results: Silicates (basically sand) were found in the comet impact debris, as expected. The silicate grains were smaller than typical sand. They included the mineral olivine. But unexpected findings included clay and carbonates. No one knows how clay and carbonates could have been created in a comet. Also found were somewhat unexpected iron-bearing compounds and aromatic hydrocarbons.

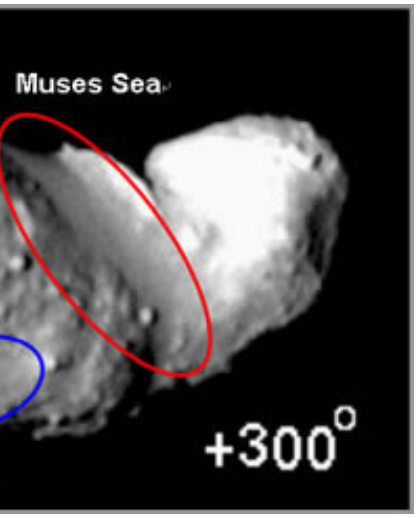
**Hayabusa** (Japanese asteroid mission) arrived at its target asteroid Itokawa and parked 12 miles away to search for good landing spots. The arrival was somewhat late from having to deal with slight solar panel damage early in the flight. Between now and early December, the spacecraft will land on the asteroid, deploy a hopping (not wheeled) rover named Minerva, take 1-3 samples of the surface material, and begin its journey back to Earth to land in the Australian outback in June 2007 with the samples. Hayabusa uses an ion drive propulsion system to transfer from the Earth's orbit to the asteroid's orbit (which is Earth-crossing) and back. Itokawa is only about 2000 feet long by 900 wide. The spacecraft has an automatic navigation system to guide it to so small a target so precisely. The first images of Itokawa were returned, showing it is potato-shaped, with rocky, hilly and smooth regions. Much of the surface appears to be covered with a loose layer of dust, which was not expected from theory.

**Chandra** (X-ray space telescope) has observed the predicted collision of a supernova shock wave with a sphere of gas thrown off before the supernova. In 1987 astronomers observed the nearest supernova in about 4 centuries, occurring in the Large Magellanic Cloud, a satellite galaxy to our Milky Way. It was known that the star before it exploded had first thrown off a lot of material in a continuous stellar wind, followed by briefer high-speed stellar wind that pushed the older material out into a hollow sphere about the star. It was predicted that the shock wave from the supernova explosion would reach the sphere of material and cause it to heat up and produce X-rays. Chandra has now observed that ring of X-rays circling where the supernova took place 18 years ago. As the shock wave continues through the material, continued observations will show details of that material.



*Four views of Ceres (STScI)*

**Hubble Space Telescope** (HST) – Those clever spacecraft controllers figured out how to reprogram HST to run on 2 gyros, even though it was designed to run on 3. During guiding, the guidance sensor supplies the information that the third gyro did, and during slewing, the magnetometers and star trackers substitute for the third gyro. Tests have shown that the quality of operation with 2 gyros is indistinguishable from that with 3. So they turned off one gyro, and hope to thereby extend the useful life of HST by many months. Currently 2 of the 6 gyros have failed. Now it will take 3 more failures instead of 2 to put HST out of business. The new head of NASA is still studying restoring the Shuttle mission to repair HST, including gyros, which was canceled by his predecessor.




HST was used to study the largest asteroid **Ceres**, with the following results: It is nearly spherical, with the equator slightly larger across than the polar direction. Most nearly-spherical bodies were heated during their formation sufficiently to melt them throughout, resulting in separation (called differentiation) of the constituents when the heavier ones sink to the center. Ceres's density is less than that of the Earth's crust, leading astronomers to speculate that there may be a layer of water below the surface in order to explain the density. This agrees with previous spectroscopic studies that showed water-bearing minerals on the surface.

**Instant AstroSpace Updates:**

**Earth's core** – Geologists studying the waves that traveled through the Earth from 18 doublet earthquakes (pairs of nearly identical ones years apart) found that the Earth's iron core had rotated between each, relative to the surface. Analysis of this data showed that the core rotates about 1 degree per year faster than the surface.

**Space Shuttle** – In order to solve the problem of large pieces of insulating foam breaking off the shuttle external fuel tank during launch, NASA has postponed the next launch until March 2006. This may be further delayed due to damage to NASA facilities from Hurricane Katrina.

A **meteoroid** a few yards across was tracked as it burned up near Antarctica, and it was found to produce in the stratosphere a 1000-ton cloud of roughly 10-micron-sized **dust** particles substantial enough to affect local weather through reflection of sunlight and cloud formation on the particles. It had been thought that smaller particles result from such events, so small that they would not affect weather.

The South African Large Telescope (**SALT**) has taken its first images after 5 years of construction. Its primary is an array of 91 mirrors, like the Hobby-Eberly Telescope in Texas, and is second in size only to the Keck Telescopes.

Geoff Marcy and Michel Mayor shared the million-dollar **Shaw Prize** for astronomy. Mayor found the first exoplanet (planet orbiting a star other than our Sun) about a decade ago, and Marcy and his team have since discovered over 110 more exoplanets.

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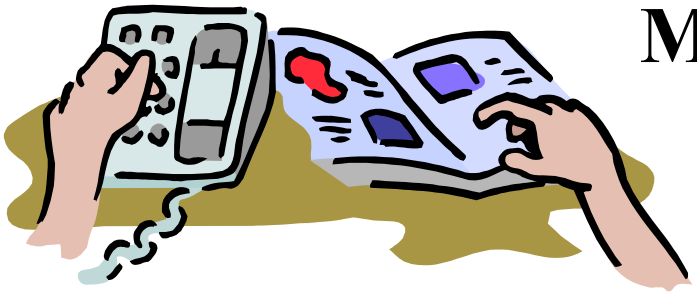

# Magazine Subscriptions

A great way to save money just because you are a member of the OCA!

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

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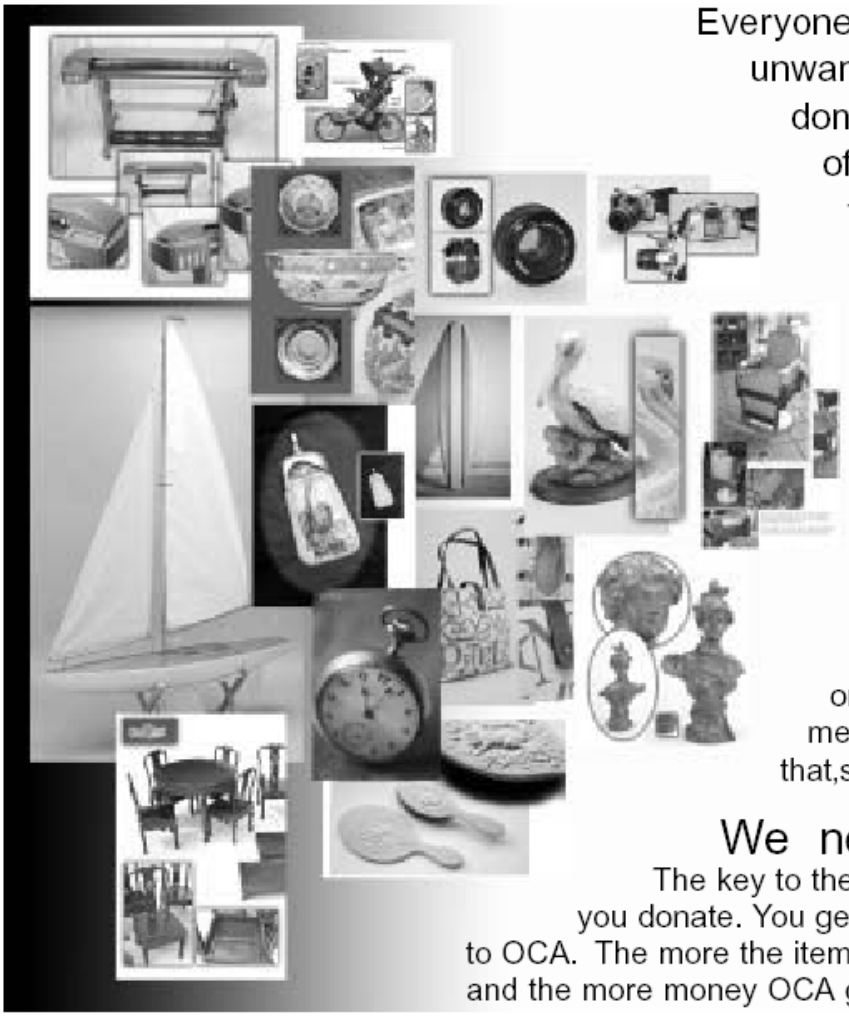
| Sky & Telescope ..... | **$33.00** | $42.95 |
| ASTRONOMY ..... | **$34.00** | $42.95 |

The **DEADLINE** for subscribing at the club rates will be the **October monthly meeting, October 14th.** The publishers will send expiration notices to all current club subscribers about November 1st even if you renew through the club. It takes the publishers a few weeks to process renewals.

*Horsehead Nebula in Orion, taken 9/25/05 (Leon Aslan)*

# Don't Forget !
# Bring In Your Items for the OCA Auction!



Everyone in the club has some unwanted items that they don't use at home or at the office that are too valuable to throw away, so they just get stored forever!

We are asking you to clean out your closets, dust off these items and donate them to OCA .

We will turn these items into cash by putting them in eBay auctions. There are over 800 members in OCA. Our goal is to just get one good item to auction from each member. If you would like to donate more, that,s wonderful!

## We need your help!

The key to the OCA auction is the quality of the items you donate. You get a tax deduction on anything you donate to OCA. The more the item is worth the better the deduction you get and the more money OCA gets for the needed ANZA repairs

**Some Suggested Types Of Items**

Antiques • Business & Industrial Equipment • Cameras & Accessories • Cars & Accessories
Clothing, Shoes & Accessories • Collectibles • Computers & Networking • Electronics
Jewelry • Memorabilia • Musical Instruments • Sporting Goods • Sports Memorabilia
Hobbies • Video Games • Astronomy

We will collect your items at the general meetings. If you can't come to the meetings or if you have trouble getting your items here because they are too large you can make arrangements to have them picked up.

If you have any questions concerning this OCA eBay fundraiser we ask that you email
Wendy Adams at wadams@clearpointadv.com
Please putOCA eBay in the subject line.

To setup a pickup time call Larry McManus at Clearpoint.

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