SIRIUS ASTRONOMER

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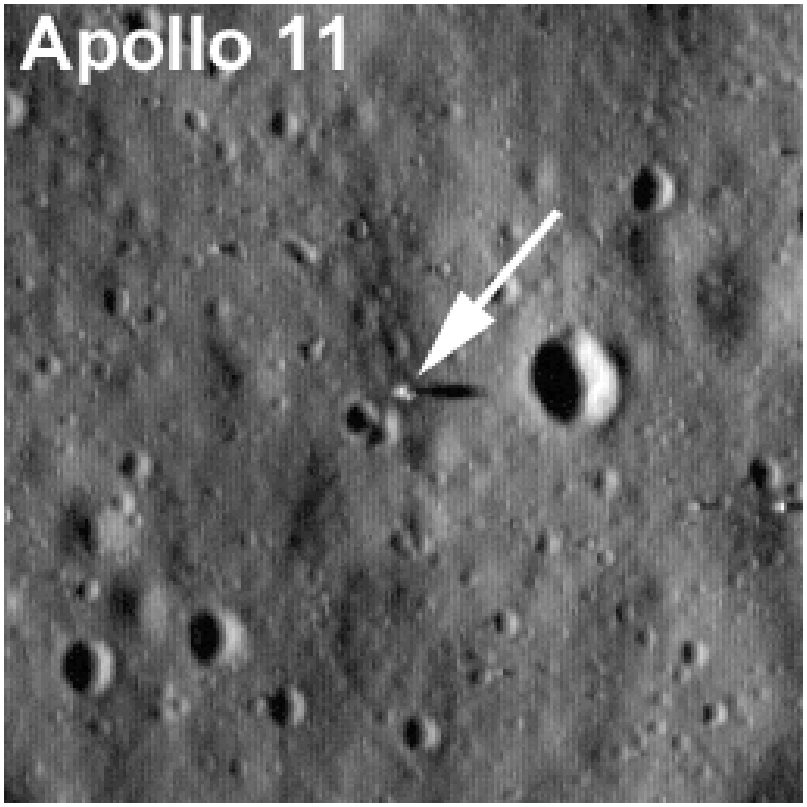

The Apollo 11 landing site as imaged by NASA's Lunar Reconaissance Orbiter. The satellite reached lunar orbit June 23 and captured the Apollo sites between July 11 and 15. Though it had been expected that LRO would be able to resolve the remnants of the Apollo mission, these first images came before the spacecraft reached its final mapping orbit. Future LROC images from these sites will have two to three times greater resolution. This image covers an area 282 meters (approx. 985 feet) across. Credit: NASA/Goddard Space Flight Center/Arizona State University

OCA CLUB MEETING

The free and open club meeting will be held Friday, August 14th at 7:30 PM in the Irvine Lecture Hall of the Hashinger Science Center at Chapman University in Orange. This month, Dr. Rachel Kuzio de Naray of UC Irvine will discuss 'Dark Matter: The Invisible Mass of Galaxies'.

NEXT MEETING:
September 18th

STAR PARTIES

The Black Star Canyon site will be open on August 15th. The Anza site will be open on August 22nd. 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, July 3rd at the Centennial Heritage Museum at 3101 West Harvard Street in Santa Ana.
GOTO SIG: TBA
Astro-Imagers SIG: Aug. 18th, Sept. 15th
Remote Telescopes SIG: Aug. 26th, Sept. 23rd
Astrophysics SIG: Aug. 21st, Sept. 11th
Dark Sky Group: TBA

August 2009 President's Message

By Barbara Toy

For those who thought summer was a long time coming this year, what with that cold spell in June, July should have relieved those fears and August should continue the trend. These warm nights are certainly nice (though the night of the July star party carried the "warmth" theme a bit far, as it never cooled below 77 degrees), wearing T-shirts instead of multiple layers of insulation against the cold, and with no worries about fogging your eyepiece by looking through it. Unfortunately, the days are a lot less pleasant, unless you are one of those people who really enjoys sweating copiously, but that's the price we pay for the pleasures of the summer Milky Way.

We tend to think of rain damage to the roads around Anza as a winter issue, but this is thunderstorm season, and the storms coming through can deliver a lot of water in a short period of time, which is not good for our equipment and can play havoc with dirt roads. Overall, our roads have been pretty passable over the last few months, but don't be surprised if you do find damage.

September And October Meetings – Dates Changed!

As a reminder, the September and October general meetings have been moved from our usual second Friday of the month to the third Friday of the month. The September meeting will therefore be on September 18th, and the October meeting will be on October 16th. If you come on the usual night for either of those meetings, you will find that Chapman University is having its own event in the auditorium that, regardless of what it might be, is extremely unlikely to have anything to do with astronomy. So, please mark your calendars, and we'll look forward to seeing you all at the re-scheduled meeting dates for September and October.

Also as a reminder – because of this change in the scheduling of the general meetings, the Astrophysics meetings have had to be moved as well. The September Astrophysics meeting will be on the second Friday of the month, on September 11th, and the October meeting will be on the *fourth* Friday of the month, on October 23rd. These changes are all noted on the club calendar on the website, so please check there for the latest on what's happening when.

Anza Sun

Anyone who has been outside at Anza during the hot summer days knows how brutal the sun can be out there. We had a reminder about how dangerous the midday heat can be on the day of the July Star Party. A member was cleaning up weeds in the area around his pad and collapsed due to the heat; I don't know if what happened was a full case of heat stroke, but, if not, it came far too close for comfort. Fortunately, he was found by another member, Sam Saeed, who got him down to Anza house, where Marilyn Saeed and other helpful folk put him in front of the swamp cooler to help cool him down and gave him fluids to rehydrate him. After a night's rest, another member followed him home on Sunday morning and reported that he made it home without any problem. He seems to have made a complete recovery without side effects from the experience, which we were all glad to hear, but we are really sorry this happened..

If you have to work out at Anza in the heat of the day (or any other hot location), please make sure you drink lots of water and other fluids (it's a good idea to drink something as part of your fluids that will replace electrolytes lost to sweat). If you start feeling at all abnormal, please stop what you're doing and cool yourself down – and consider whether you really need to continue working right then or whether you can wait until it's cooler outside. And, while it's important to keep the weeds under control at Anza, it's not worth risking your health for that, or even your life if you collapse and nobody finds you in time.

A Sad Farewell To Trustee Sheryl Benedict

As a classic case of good news/bad news, Sheryl Benedict, who has been a club Trustee for the last two years and also has been looking for a job since she was laid off in December has finally found a new employer who values her many talents. From what she's told me, the position should be one that will give her a lot of opportunities to grow professionally, doing work she's always been interested in, which is really great. The down side of this is that the position is in Tennessee, and she will already have moved to her new home by the time you see this.

We will really miss her sense of humor and calm good sense on the Board, as well as her contributions to the GoTo Group and the AstroImaging group. She's taking her astronomical equipment with her – a very good thing – and has already investigated the local clubs around where she will be living. It looks like she may become a member of the Nashville club in addition to maintaining her membership in our club at long distance. When she's had a chance to explore the dark sites and the local astronomy community out there, it'll be interesting to get her perspective. We expect that she'll visit Southern California in the future, and hope that she'll join us at whatever meetings, star parties or other events we may have going while she's here.

Good luck with your new job and in your new home, Sheryl! And we hope you'll stay in touch….

Board Nominations Are Coming Up in October…

While we're on the subject of Board members, it's not too early to begin thinking about running for the 2010 board, as we start taking nominations in October and continue through the end of the November general meeting. You can be nominated by either e-mailing Bob Buchheim or me before the November meeting or by nominating yourself or having someone nominate you at the October or November general meetings.

Under our bylaws, you have to be a member for at least a year to be eligible to run for a general Trustee position on the Board or for Secretary or Treasurer. For the position of President and Vice President, you have to have served on the Board for at least a year, though not necessarily the year before you run for those offices.

If you have any interest in how our club is governed, or in the possibility of running for office, I strongly recommend that you come to at least one Board meeting, to see what happens at the meetings, the types of issues that we discuss and the decision-making process in general. I've been on the Board in different capacities for nine of the last 10 years, and, while there have been tensions on occasion, I have generally found that the group (even with changes in personnel over the years) is congenial, respectful of one another, and generally a really good bunch of people to socialize with as well as work with. Every year, we have had at least one or two new people on the Board, which helps keep us from stagnating and gives us new perspectives. Besides enjoying getting together with other Board members for our meetings (the formal meetings are every odd numbered month, starting in January, and we sometimes have additional sessions – though rarely), I always enjoy seeing them at events other than board meetings as well. The reason for pointing this out is that one good reason to join the Board is to meet and work with a really great group of people.

The classic reason most people give about why they join the Board is to "give back to the club." That may sound a bit trite, but I think it genuinely expresses the feelings of the people who have served on the Board during the time I've been involved with it – and I'm sure it's true of prior Boards, too. It does give you a great sense of satisfaction to help meet the challenges that face the club at different times. Our biggest long term challenge is to keep the club strong and viable, and help it change where needed to meet the needs and interests of its members. One way to help us recognize where changes may be needed or where needs of members may not be adequately met is to continue to have new people join the Board every year – which is where you come in. Seriously – do consider running for the Board this year, and let Bob and me know that you want your name on the ballot.

SCAE 2009

The Southern California Astronomy Expo, which has been organized and run by Oceanside Photo and Telescope for the last four years, took place on two Saturdays in July. I'm sorry that I wasn't able to attend either day this year, and that the second Saturday of the event was the same day as our star party and Starbecue – which meant that a quite a few people who were out at Anza weren't able to attend.

The first Saturday featured a swap meet and other activities. Wally Pacholka kindly agreed to be responsible for the booth, and brought a number of his pictures and items to sell, giving the club a 10% commission on his sales, which was a great way to make the booth unique and interesting and also bring in a bit of money. We had a short-term member, an astronomy professor from Northern California named Sandy Bumgarner, who brought some equipment he wanted to sell, so the booth had a respectable inventory.

The other members that I know helped out over the course of the day included Liam Kennedy, Mike Burton and Vince Laman; Stan Slonkosky was also prepared to help if needed, but wound up helping the following weekend instead, with Tom Drouet. I'm told that attendance was not very heavy for the swap meet, which may be because this was the first time they tried this. I don't know how attendance on the second Saturday

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This month's theme of the International Year of Astronomy is "Rocks and Ice in the Solar System"

Moments Remembered

By Tom Koonce

Antelope Valley Astronomy Club

Lancaster, California

June 20, 1994: My uncle generously decided to pass along his 8 inch Schmidt-Cassegrain telescope to me and make the switch to binoculars that better fit his astronomical observing habits. That gift was what launched me into "serious" amateur astronomy…but that's not why I remember the date so well.

Saturday night, March 23, 1996: My wife and I drove 25 miles north on I-35 out of Fort Worth to a dark, quiet country lane with open fields on either side of us. Surprisingly there were at least a hundred other cars already parked along the sides of the road with people getting ready to do exactly what we were going to do …but that's not why I remember the date so well.

"Rocks and Ice in the Solar System" have made an indelible mark on mankind and probably on each of you too. Our recorded history is full of dramatic references to cometary visitors and falling stars. Many of history's events have been influenced by the superstitious belief that comets were harbringers of great success or of doom. Many of us have read of Augustus Caesar ascending to Emperor of Rome as a comet hung in the sky. It was common for royal births and deaths that occurred during comet apparitions to be recorded as being related directly with the comet. As William Shakespeare said, "When beggars die there are no comets seen; the heavens themselves blaze forth the death of princes."

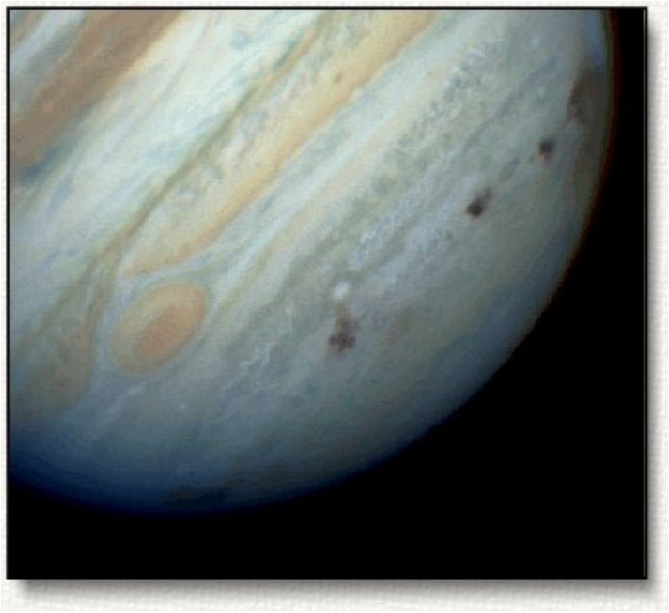
If you've seen a comet and its tail, even if faintly through a telescope, you know how dramatic they appear. The brightest, most easily visible comets are called "Great Comets." These can be seen by the naked eye by multitudes of people across the Earth while the wisps of their icy tails are blown back by the solar wind. As they stretch across the sky, they are so extraordinary that they are easily remembered for the rest of a person's life. It seems natural that they have figured so prominently throughout history; indeed it would seem more remarkable if they had not!

Comet Hyukatake (Amador Astronomical Society)

The Saturday night of March 23, 1996, is fixed firmly in my memory as the night we spent watching Comet Hyukutake stretching gracefully across the northern sky. It was awe inspiring. Even though there were several hundred people on that dark road that night, only hushed voices were heard. We were casually sitting on the hoods of our cars and in lawn chairs, but everyone knew that we were witness to a very special celestial event, and there was a certain reverence to the moment. Later, a police car came around a bend of the road and his headlights shone upon all of the cars and the people looking up at the sky. He came to a sudden stop and the officer just sat in his car for a few minutes looking at us. He must have been quite startled by the scene. I'll never forget what happened next. He got out of his car, looked around slowly at us, started to say something, but stopped… and then he looked up. He just stood there looking for a minute then walked back to his car, turned off the headlights and shut off the car. He came back over without saying a word and watched The Great Comet of 1996 with us for a half hour or so. As I said, there was a certain reverence to the moment.

Our solar system has countless asteroids, and distant rocky Kuiper Belt Objects. Our Earth is struck many times each minute by particles of rice grain-sized rock. 40,000 kg of material falls daily on Earth, most of it in the form of micrometeorites that hit the upper atmosphere, and then fall to Earth. We know that these rocks from space come in many different sizes and some are even left over debris from cometary tails. I have seen great displays of meteoritic activity. Several years ago (November, 2002) a fellow amateur astronomer and I witnessed a stunning (but sadly, too short) five minute burst of Leonid meteors with an equivalent rate of over 700 per hour from a dark sky site. I'm sure we will always remember that portion of the evening and that we were the only two observers left when the meteor shower peak finally came.

Occasionally the Earth gets hit by rocks and ice that are truly impressive. The Tunguska Event in 1909 was very likely caused by a collision of rock or ice with the Earth. Several mass extinctions of life on the planet have been attributed to collisions at a much larger scale; for instance the demise of the dinosaurs 65 million years ago may have been from an asteroid approximately



Photos Courtesy of NASA

4 to 9 miles across. But these events seem to lack the real-world immediacy which resulted from a chain of events that started at Mount Palomar on the night of March 24, 1993. That night, a photograph taken by Carolyn and Eugene Shoemaker and David Levy revealed a comet which now bears their names. It was soon determined that their comet was headed towards Jupiter on a collision course and it was breaking up into a "string of pearls"; a long line of cometary fragments that would hit Jupiter like slow-motion bombardment. If we fast forward fifteen months - I received the C-8 from my Uncle on June 20, and was learning how to use it efficiently. Exactly a month later, on July 20, 1994, I vividly remember looking through the telescope with several other amateurs as we watched the face of Jupiter turn slowly towards us to reveal the scars of massive cometary collisions the size of the entire Earth. There were a few brief cries of astonishment that the impact was so visible followed by stunned silence as we contemplated the energies involved in collisions that could have wiped the Earth clean of life. There was a certain reverence to the moment. Astronomy offers unforgettable moments like those to us.

We do not remember days; we remember moments. -- Cesare Pavese

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compared with past SCAEs, but it seems that Tom and Stan were kept busy.

Many thanks to all these great people for giving us a good presence at this event! And, if I've left anyone out – my apologies, and I hope you'll let me know so I have a better picture of who all was there.

Opportunities…
Some people have asked whether we'll be having another club night at Mount Wilson, using the 60 inch. If you would be interested in being part of a night up there, please send me an email letting me know (the address is btoy@cox.net). Even more important – if you would be willing to act as the coordinator for the group, that would be wonderful and would help get such an event up and running.

When you email me about your interest in a Mt. Wilson night, please also let me know if you're mainly interested in a night of viewing or a night of imaging – groups doing viewing can be bigger than groups doing imaging, which means that the cost can be spread among a greater number of people.

Some of the people who wanted to go to Dennis Mamana's Night Sky Photography class last year but couldn't make it, and other club members as well, may be interested in having a class with Dennis this year. If we get enough people (14 is the minimum), he would be willing to schedule a special class for the group. If you're interested in the class, please email me. We would also need a coordinator for the group, to make sure we have the 14 people and to take care of gathering the payments and getting information about the class to the people who sign up for it. If you can take on that role, please at me know.

Based on the class we had last year, Dennis provides around five hours of lecture instruction, filled with helpful information, and he encourages questions; his interest is in seeing that everyone who attends truly understands the material and can use it in the field. The lecture part is followed by dinner and then a hands-on session under the stars. These classes are usually before first-quarter moon, so the moon is bright enough to illuminate the landscape but not so bright that it blots out the stars. I found last year's class very informative and a lot of fun, and, while I have no pretensions of ever reaching the skill level of night sky

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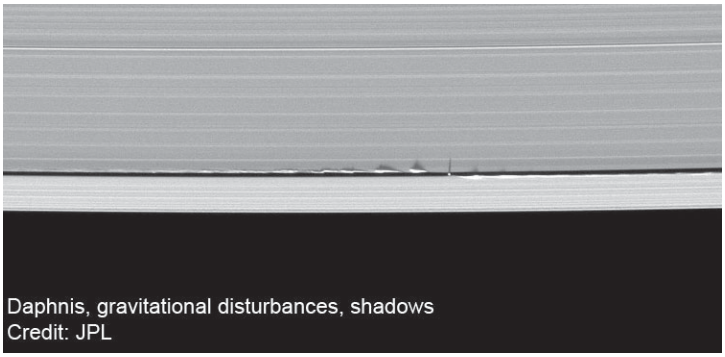
AstroSpace Update

August 2009
Gathered by Don Lynn from NASA and other sources

Cassini (Saturn mission) – A study of Cassini data has detected sodium salts in ice grains of Saturn's outermost ring. Since geyser material from the moon Enceladus supplies the material in this ring, the sodium detection implies that Enceladus has salty water, perhaps an ocean, beneath its surface. This also implies that the geysers are throwing out liquid water, not ice as some scientists believe, because ice particles would not have dissolved salt like liquid water does. Carbonates were also found in the ring particles. Another study, but made using Earth-based observations, came to the conclusion that the amount of salt found in this ring is so little that it implies Enceladus does not have a salty ocean. A third theory was presented that there is a salty ocean, but that the liquid water evaporates below ground, losing most of the dissolved salt, then is geysered out as vapor. Obviously, more research is needed to settle this.



Daphnis, gravitational disturbances, shadows
Credit: JPL

Cassini has imaged the disturbances caused at the edge of one of Saturn's rings by the gravitational effect of the close passage of the moon Daphnis and found that the disturbances tower vertically as much as 1 mile above the plane of the rings. The observation was made possible by the plane of the rings being nearly aimed at the Sun (this happens twice per Saturn year, which is more than 29 Earth years), so that anything above the rings casts a very long shadow onto the rings. It had been theoretically predicted that these disturbances were both horizontal and vertical, but only the horizontal extent had been imaged until now.

Intermediate black hole – Essentially all black holes known are either supermassive (millions or billions of times the Sun's mass) or are the mass of a large star. Only a few candidates have been identified with mass intermediate between these extremes. The best evidence yet for an intermediate black hole was found by the XMM-Newton orbiting X-ray telescope. It lies near the edge of the galaxy ESO 243-49 and appears to have a mass of more than 500 times the Sun's. Sources of X-rays other than a black hole have been ruled out by observations.

Rogue black holes – It has long been believed that merging galaxies should sometimes throw a supermassive black hole out of the galaxies, though none has been found. Last April it was announced that simulations of merging galaxies showed that such rogue black holes should drag a cluster of stars with them, making them easier to find. A new study showed that a rogue black hole should wander around the galaxy cluster of its origin, and would appear much like a globular cluster. But it can be distinguished from a globular cluster by measuring the velocities of the stars, which would be much higher about a black hole, or by its X-rays given off when material falls into the black hole. Measuring the velocities of a rogue black hole and the stars orbiting it would allow reconstructing where, when and how much energy was involved when the galaxy merger occurred that tossed out the black hole. So the search is on to find one of these objects.

Farthest supernova – A new technique for finding apparently very dim (and therefore very distant) supernovas has been tried, resulting in finding the 2 farthest known supernovas of massive stars (excluding Type Ia). They are so distant that we are now seeing the light that left the supernovas 11 billion years ago. Typically supernovas are found by taking images of galaxies likely to produce supernovas, and comparing the images with old images of the same place to find any new bright object. The new technique stacks multiple images taken over a period of months in order to bring out dimmer objects than can be discerned in any single image.

Transient search – The 48-inch Oschin Schmidt telescope at Mount Palomar has been fitted with a new CCD camera and a new search has begun to find transient objects in the sky, including supernovas and gamma-ray bursts. The search is being called the Palomar Transient Factory. The commissioning phase discovered 40 supernovas and 4 cataclysmic variables, and it is predicted that thousands per year will be found. The new CCD has 100 megapixels and produces many terabytes of data every night. Computers must sift through this every day to find changes from previous images. The software lead person is OCA member Robert Quimby. The Palomar 60-inch and other telescopes will make follow-up observations on the new objects found.

Gamma rays – There are different theories to explain the distribution of gamma rays that have been observed about our Milky Way galaxy. One of those theories is that dark matter decays and produces gamma rays. Another is that positrons (anti-electrons) collide with electrons and produce gamma rays. It has long been known that supernovas create radioactive elements that produce positrons when they decay. The problem with the second theory is that positrons ought to travel huge distances before by chance hitting an electron at the right speed, and that would create the gamma rays over a much larger volume than was observed. A new simulation of positrons, taking into account more factors, such as magnetic field fluctuations, has produced the same distribution of gamma rays as was observed. This means that the positron theory is probably correct, and the dark matter decay theory is probably wrong.

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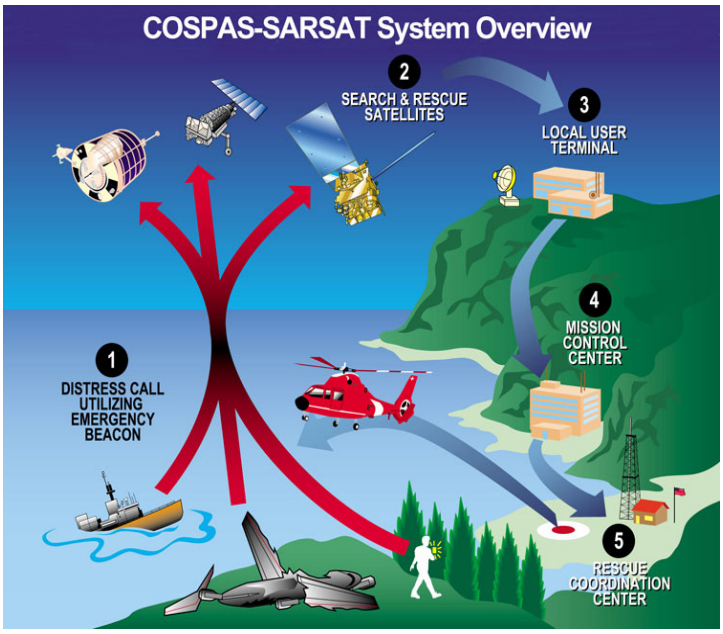
NASA's Space Place

SARSAT to the Rescue

If a plane crashes in the woods and nobody hears it, does it make a sound? Never mind contemplating this scenario as a philosophical riddle. This can be a real life or death question. And the answer most of the time is that, even if no people are nearby, *something* is indeed listening high above.

That something is a network of satellites orbiting about 450 miles overhead. The "sound" they hear isn't the crash itself, but a distress signal from a radio beacon carried by many modern ships, aircraft, and even individual people venturing into remote wildernesses. In the last 25 years, more than 25,000 lives have been saved using the satellite response system called Search and Rescue Satellite-aided Tracking (SARSAT). So what *are* these life-saving superhero satellites?



NOAA's polar-orbiting and geostationary satellites, along with Russia's Cospas spacecraft, are part of the sophisticated, international Search and Rescue Satellite-Aided Tracking System.

Why they are mild-mannered weather satellites. "These satellites do double duty," says Mickey Fitzmaurice, a National Oceanic and Atmospheric Administration (NOAA) systems engineer for SARSAT. "Their primary purpose is to gather continuous weather data, of course. But while they're up there, they might as well be listening for distress signals too."

In February, NASA launched the newest of these Polar-orbiting Operational Environmental Satellites (or POES) into orbit. This new satellite, called N-Prime at launch and now dubbed NOAA-19, prevents a gap in this satellite network as another, aging NOAA satellite reached the end of its operational life. "The launch of N-Prime was a big deal for us," Fitzmaurice says. With N-Prime/NOAA-19 in place, there are now six satellites in this network. Amongst them, they pass over every place on Earth, on average, about once an hour.

To pinpoint the location of an injured explorer, a sinking ship, or a downed plane, POES use the same Doppler effect that causes a car horn to sound higher-pitched when the car is moving toward you than it sounds after it passes by. In a similar way, POES "hear" a higher frequency when they're moving toward the source of the distress signal, and a lower frequency when they've already passed overhead. It takes only three distress-signal bursts — each about 50 seconds apart — to determine the source's location.

Complementing the POES are the Geostationary Operational Environmental Satellites (GOES), which, besides providing weather data, continuously monitor the Western Hemisphere for distress signals. Since their geostationary orbit leaves them motionless with respect to Earth below, there is no Doppler effect to pinpoint location. However, they do provide near instantaneous notification of distress signals. In the future, the network will be expanded by putting receivers on new Global Positioning System (GPS) satellites, Fitzmaurice says. "We want to be able to locate you after just one burst." With GPS, GOES will also be able to provide the location of the transmitter.

Philosophers beware: SARSAT is making "silent crashes" a thing of the past.

Download a two-page summary of NOAA-19 at www.osd.noaa.gov/POES/NOAA-NP_Fact_Sheet.pdf. The Space Place gives kids a chance to rescue stranded skiers using their emergency rescue beacons. The Wild Weather Adventure game awaits them at spaceplace.nasa.gov/en/kids/goes/wwa.

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

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M87 (giant galaxy) was being monitored in gamma rays and radio for a new study when it happened to give off a gamma-ray flare. This was the first observation confirming theoretical results showing that particles are accelerated to extremely high energies in the immediate vicinity of a supermassive black hole in the center of such galaxies, and then those particles produce gamma rays. The radio observations were able to pinpoint exactly the location of the flare in relation to the black hole. M87 is about 50 million light-years away in the Virgo cluster of galaxies.

Fermi (orbiting gamma-ray telescope) – Astronomers have analyzed 2 dozen pulsars observed in gamma rays, including 16 pulsars discovered by Fermi. A pulsar is a spinning neutron star. Fermi observations have shown that the mechanism to produce gamma rays in millisecond (fast spinning) pulsars is the same mechanism as for slow pulsars. The Vela pulsar is the brightest permanent source of gamma rays in the sky, yet Fermi sees only about 1 gamma-ray photon every 2 minutes from it. The faintest detected pulsars produce only about 2 photons a day. So Fermi has to make really long exposures to image gamma-ray objects.

Chandra (orbiting X-ray telescope) has identified what makes giant blobs of gas around very young galaxies glow in visible light. Such blobs were discovered about a decade ago, but the light source has been a mystery. The energy comes from growing supermassive black holes partially obscured by dense dust and gas. The Chandra observations were made of 29 very distant blobs, so far that we are seeing them as they were only about 2 billion years after the Big Bang. The blobs are a stage in galaxy formation, and occur when massive amounts of material fall into the central black hole, which gives off X-rays that heat the remaining gas in the blobs. Some of the observed blobs were also found to be forming massive amounts of new stars, which added to the heating of the gas blobs. The heating will soon bring to nearly a stop both the rapid growth of the black hole and the rapid formation of stars. Then the galaxy will settle into middle age.

Cosmic rays – A study using the Very Large Telescope in Chile and Chandra (orbiting X-ray observatory) showed that supernova remnants can accelerate protons to higher energies than possible with any particle accelerator on Earth, resulting in the protons becoming cosmic rays. The study found that the energy to accelerate particles is removed from the heat energy of the expanding shock waves in the remnant, resulting in cooling of the gas, down to only 54 million degrees F. The supernova has enough energy to heat its shock wave to nearly a billion degrees, if not for the loss of energy to particle acceleration.

APEX (submillimeter radiotelescope) has produced the largest map of cold dust in space, covering the center of our Milky Way galaxy. It shows thousands of previously undiscovered dense knots of dust, the potential birthplaces of new stars. The dust clumps are typically a couple of light-years in size and have masses between 10 and a few thousand times the Sun's mass. The new map also shows filamentary structures and bubbles in the interstellar medium blown by supernovas and stellar winds. APEX will continue to observe so as to expand the area of the map until all of the Milky Way is covered. APEX is a 12-meter telescope located at nearly 17,000 feet elevation in the Andes Mountains of Chile, to be above most the atmospheric water vapor that blocks submillimeter waves.

IBEX has been observing the boundaries of our solar system, where solar wind interacts with interstellar material, which is the spacecraft's mission. But occasionally the Moon passes through the field of view. IBEX observed fast hydrogen atoms coming off the Moon, caused by the solar wind scattering off the Moon's surface. Though long predicted, this is the first time such atoms have been detected. The measurements indicated that about 90% of the solar wind sticks to the Moon, with only about 10% scattering off into space. The solar wind particles are electrically charged, but pick up electrons from the Moon, and thereby become neutral hydrogen.

Mars rover Spirit, while stuck in soft soil, has been using its time, among other uses, to make night-time observations. Scientists are looking for clouds, fog and hazes that occur at night. Also the sky is being observing during twilight to determine how fast the glow fades after sunset. This appears to be related to the dust distribution in the atmosphere. Spirit also made night-time observations back in 2005.

By chance, **Spirit** is stuck in one of the most interesting places geologically. So its observations of the soil and rocks nearby are producing great scientific data. When the rover broke through the stiff surface layer, it revealed a cross section of soil layers beneath, recording past geological history. Layers have been found to contain basaltic sand, sulfate-rich sand and silica-rich materials, possibly sorted by wind and cemented by the action of thin films of water. Controllers expect to free Spirit soon, but are being quite cautious so as not to make its situation worse.

Mars Phoenix (recent polar lander) – Study of Phoenix data showed that it snows on Mars, and at certain latitudes and times of year the snow reaches the ground. There had been debate about whether the increased polar cap during winter was from snow falling or from frost or some other means. Snow was observed to fall at night, and then sublime (evaporate without becoming liquid) into water vapor during the next day. Turbulence then distributed the water vapor as high as 2.5 miles, where it participated in formation of ice crystal clouds. This adds greatly to our understanding of the water cycle on Mars.

Further analysis of **Phoenix** data indicated that the landing site had a wetter and warmer climate in the (geologically) recent past, the last few million years. Finding calcium carbonate in the soil implies that the water ice found just below the surface sometimes thaws enough to moisten the soil, which would react with carbon dioxide in the atmosphere to form the calcium carbonate.

Mars Reconnaissance Orbiter (MRO) – Study of equatorial landforms seen in great detail in MRO images show that the ground thawed as recently as 2 million years ago, in contradiction to theories that Mars has been locked in a cold spell for billions of years.

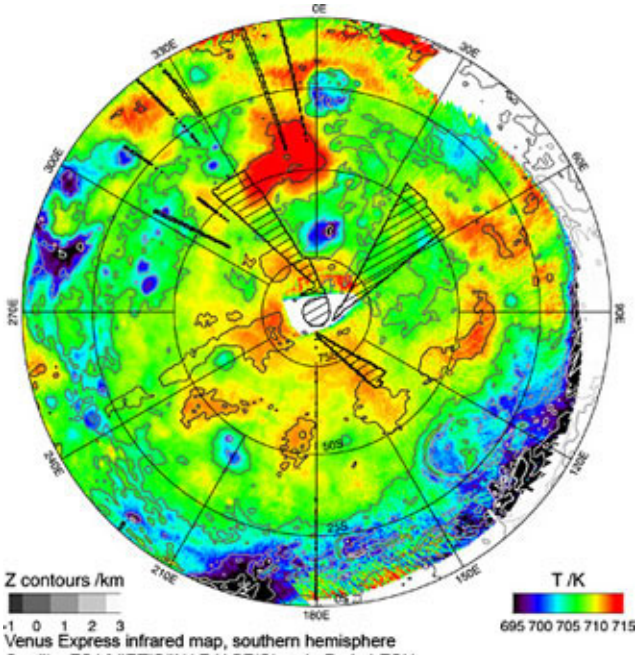
Features that had been interpreted from lower resolution images as volcanic forms were instead found to be caused by the expansion and contraction of ice. These include polygonally pattered surfaces, branched channels, blocky debris and mound/cone structures. Similar features on Earth are known to be produced by ice thaw/freeze cycles. The Martian features occur in a channel on top of features dated at 2-8 million years old.

A study of MRO images has uncovered the best evidence yet for former **shorelines on Mars**. The shorelines found probably were the edge of a deep (about 1500 feet) lake about 3 billion years ago. A series of alternating ridges and troughs were found, thought to be ancient beach deposits. Water carved a 30 mile long canyon that opened up into the lake, depositing sediment that formed a large delta. The delta implies the lake was long lived. Most Mars scientists accept that the planet was warmer and wetter in the distant past, but the generally accepted date for this is 3.7 to 4.1 billion years ago. The dating of the new discoveries at no more than 3.4 billion years ago is later. The lake apparently dried up rapidly enough that no additional lower shorelines formed. It could have quickly evaporated or frozen and then slowly evaporated, but was likely due to an abrupt climate change.

Mars Odyssey (orbiter) has completed an 8-month adjustment of its orbit, moving so that it passes over the part of Mars experiencing earlier afternoon. The orbit for the last 6 years has passed over very late afternoon regions. This optimizes observations made with the infrared camera, at the expense of other instruments. Warmer ground earlier in the day emits more infrared. But it is expected that the extra heat radiated by the planet will overheat parts of the gamma-ray instruments. It was decided that sufficient gamma-ray observations have been made in past years to risk this. Another change in Odyssey operations is that it is observing at an angle from directly downward. This will allow coverage of some polar regions that the orbit does not pass over.

Mars Polar Lander disappeared during its landing in 1999. Attempts to find it in images of the landing area taken by Mars Global Surveyor were not successful. A new campaign to find it is being attempted with images of the landing area taken by MRO, which has higher resolution. The problem is, now more time has elapsed, and the wreck of the lander and its parachute may have since been covered by frost or dust. In an effort to maximize the probability of finding the Polar Lander, NASA is inviting the public to scour all their MRO images of the landing area and notify them if anything suspiciously like a parachute or wrecked lander is found. See http:// hirise.lpl.arizona.edu/ESP_013368_1035 to participate.

Mars lightning – Using a microwave detector, scientists have detected lightning on Mars for the first time. During the 12 days of observations, the lightning was detected only on the day with a large dust storm. So it is likely that the dust storm created the lightning. It would be dry lightning, as Martian atmospheric conditions do not allow liquid rain.



Venus Express infrared map, southern hemisphere
Credits: ESA/VIRTIS/INAF-IASF/Obs. de Paris-LESIA

Venus Express (European orbiter) has produced a map of that planet's southern hemisphere made in infrared, which penetrates the thick clouds. Some information as to the chemical composition can be derived from this. The map is consistent with, but does not prove, that the highlands are ancient continents created by volcanic activity. Granite possibly exists, which would imply plate tectonics and oceans once existed. No active lava flows were found, but recent-looking lava was found.

Earth map – The most complete digital topographic map of Earth was released. It was made from data collected by a Japanese instrument aboard NASA's Terra spacecraft. Previously the most complete such map was produced from the Space Shuttle radar mission. The map is expected to be used for energy exploration, conserving natural resources, environmental management, public works design, firefighting, recreation, geology and city planning, among other uses.

Carbon dioxide – Researchers have been able to determine carbon dioxide (CO_2) levels in the Earth's atmosphere over the past 2.1 million years in the best detail yet by analyzing the shells of single-celled plankton. The best previous results were from ice cores, but went back only 800,000 years. The new results show that higher CO_2 levels coincided with warmer intervals, but a drop in CO_2 was not the cause of the more intense ice ages starting 850,000 years ago. This implies that the ice ages were mainly controlled by the Earth's orbit and tilt. 2 million years ago, ice ages were occurring every 41,000 years, but starting 850,000 years ago, the ice age cycle changed to every 100,000 years and the ice sheets began to reach greater extents. The CO_2 levels were calculated from the ratio of boron isotopes in the shells.

Exoplanet – Astronomers have found an exoplanet (one outside our solar system) with an odd orbit. Most planets orbit around a star's equator. This one is tilted about 37 degrees to the star's equator. It is a massive planet, about 10 times that of Jupiter, and so the tilt must be the result of a powerful disturbance, such as a collision with a large object. The planet was discovered in 2007 by the transit method. The tilt was determined by measuring the changes in spectrum that occur during a transit as the planet passes over different latitudes (and therefore rotation speeds) of its star.

(continued next page)

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photographers such as Dennis or Wally Pacholka, I have certainly had a lot of fun playing with the techniques Dennis showed us – and fun is the reason for doing it.

I've heard that, in past years, the club had a number of field trips that included a trip to a major observatory, though I don't know which one, and at least one eclipse trip, by what I've been told. If you have an idea for an excursion that would be fun to do on a club basis, please feel free to organize it. We'll be happy to help you get the word out about it, and give you what assistance and support we can to help you bring it together.

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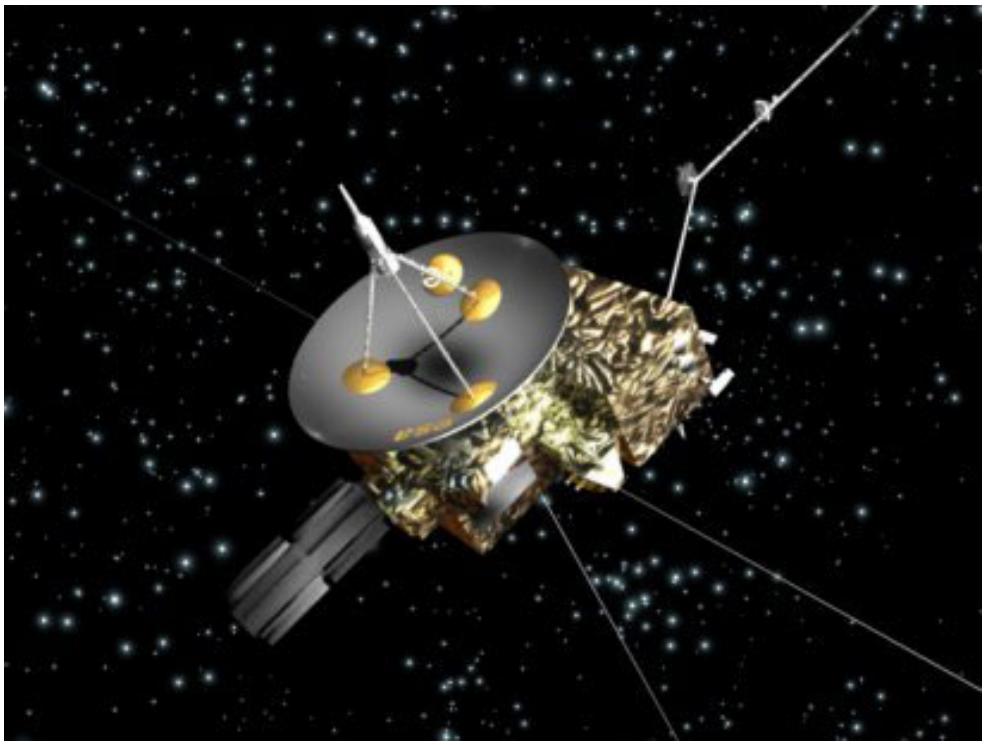

Ulysses (artist conception courtesy ESA)

Ulysses (solar polar spacecraft) was turned off at the end of June. For months it had been nearly out of the fuel used to point the craft. Its nuclear power source was no longer producing enough electricity to run fuel heaters, so to keep the fuel from freezing, tiny amounts of fuel were burned every 2 hours. A failure in the main transmitter that occurred last year was limiting data to what could be forced through the less-capable backup transmitter. Even so, valuable new data on the Sun and solar wind has been returned during the past year. It was especially valuable to see the changes that occur during the extremely quiet sunspot period that is now happening. Ulysses has spent almost 19 years in space, more than 3 times longer than originally planned, so the mission has provided a wealth of data. Besides its main mission, Ulysses by chance flew through 3 comet tails and detected more than 1800 gamma-ray bursts. It was launched in 1990, paradoxically sent away from its target, the Sun, in order to make a gravity slingshot maneuver at Jupiter to lift it out of the plane of the solar system to orbit over the poles of the Sun. Another paradox: The closest approach it ever made to the Sun was while sitting on the launch pad in Florida.

Instant AstroSpace Updates

The gamma-ray spectrometer on **Kaguya** (recent Japanese lunar orbiter) obtained the first conclusive evidence of uranium on the Moon, as well as confirming thorium, potassium, oxygen, magnesium, silicon, calcium, titanium and iron. Improved maps of their locations are being made from Kaguya data.

Astronomers made a detailed study in various infrared wavelengths of a nebula (called RCW 38) where stars are being formed. This is only the second giant **stellar nursery** (after the Orion Nebula) studied in such detail.

A new computer simulation of star formation from primitive gas clouds (devoid of heavy elements), such as occurred in the very early history of the Universe, showed that **double stars** formed more often than they do out of gas clouds that are found today.

The **Space Shuttle** mission mentioned last month as about to launch finally made it into space July 15, after delays due to a hydrogen leak and bad weather.

NASA tested a second design for an **escape system** (called the MLAS) possibly to be used on the Orion spacecraft when it is launched with astronauts aboard atop the Ares rockets now being developed. The test successfully separated the crew module and landed it gently when fired 7 seconds into a rocket ascent.

NASA has selected 2 **new missions** for development towards launches by 2015 in their Small Explorer series: A telescope optimized to observe the chromosphere layer of the Sun, and a polarized X-ray telescope to study neutron stars, black holes and other objects.

Magazine Subscriptions

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

	Club Rate	Regular Rate
Sky & Telescope*	**$33.00**	$42.95
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***Sky & Telescope subscribers please note: Due to a change by the publisher, renewals of current subscriptions should now be made directly through Sky and Telescope! New subscriptions at the club rate must still be made through Orange County Astronomers and then renewed through the publisher.**

The **DEADLINE** for subscribing at the club rates will be the **October monthly meeting, October 16th.** 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.

Sunset over Corona del Mar, CA, 7/24/09 (Michael Daugherty)

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