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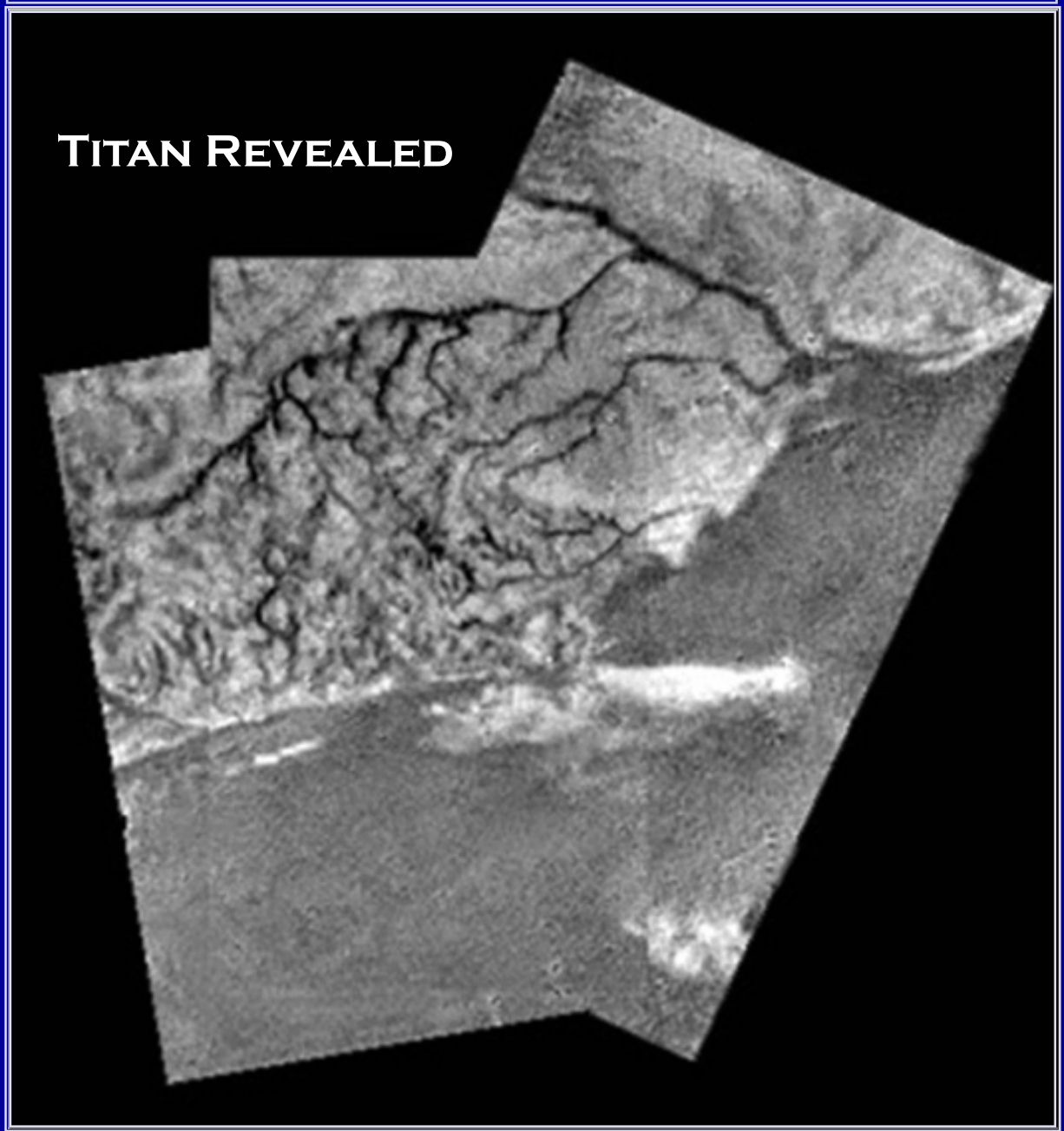
Titan Revealed



IN THIS ISSUE

Correction: The *1882 U.S. Naval Observatory Expedition Commemorated* article that appeared in the January issue incorrectly stated that the funds for the memorial were raised due to Paul Maley's efforts. The memorial was paid for by the Army. The money that was raised was for a marker that will be established at the Bullis Inn in 2005 commemorating the Belgian observations.

Titan Revealed

21 January 2005
ESA PR 05-2005.

On 14 January ESA's Huygens probe made an historic first ever descent to the surface of Titan, 1.2 billion kilometres from Earth and the largest of Saturn's moons. Huygens travelled to Titan as part of the joint ESA/NASA/ASI Cassini-Huygens mission. Starting at about 150 kilometres altitude, six multi-function instruments on board Huygens recorded data during the descent and on the surface. The first scientific assessments of Huygens' data were presented during a press conference at ESA head office in Paris on 21 January.

"We now have the key to understanding what shapes Titan's landscape," said Dr Martin Tomasko, Principal Investigator for the Descent Imager-Spectral Radiometer (DISR), adding: "Geological evidence for precipitation, erosion, mechanical abrasion and other fluvial activity says that the physical processes shaping Titan are much the same as those shaping Earth."

First Color View of Titan's Surface: This image was returned January 15, 2005, by the European Space Agency's Huygens probe during its successful descent to land on Titan. This is the colored view, following processing to add reflection spectra data, and gives a better indication of the actual color of the surface. Credit: ESA/NASA/Univ. of Arizona

Spectacular images captured by the DISR reveal that Titan has extraordinarily Earth-like meteorology and geology. Images have shown a complex network of narrow drainage channels running from brighter highlands to lower, flatter, dark regions. These channels merge into river systems running into lakebeds featuring offshore 'islands' and 'shoals' remarkably similar to those on Earth.

Data provided in part by the Gas Chromatograph and Mass Spectrometer (GCMS) and Surface Science Package (SSP) support Dr Tomasko's conclusions. Huygens' data provide strong evidence for liquids flowing on Titan. However, the fluid involved is methane, a simple organic compound that can exist as a liquid or gas at Titan's sub-170°C temperatures, rather than water as on Earth.

Titan's rivers and lakes appear dry at the moment, but rain may have occurred not long ago.

Deceleration and penetration data provided by the SSP indicate that the material beneath the surface's crust has the consistency of loose sand, possibly the result of methane rain falling on the surface over eons, or the wicking of liquids from below towards the surface.

Heat generated by Huygens warmed the soil beneath the probe and both the GCMS and SSP detected bursts of methane gas boiled out of surface material, reinforcing methane's principal role in Titan's geology and atmospheric meteorology -- forming clouds and precipitation that erodes and abrades the surface.

In addition, DISR surface images show small rounded pebbles in a dry riverbed. Spectra measurements (colour) are consistent with a composition of dirty water ice rather than silicate rocks. However, these are rock-like solid at Titan's temperatures.

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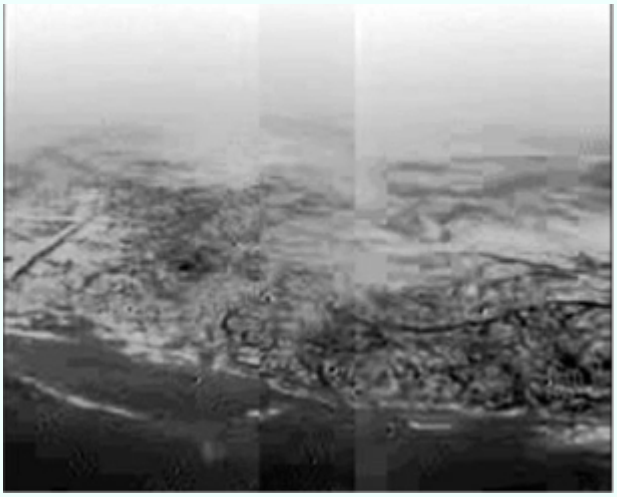
Titan's soil appears to consist at least in part of precipitated deposits of the organic haze that shrouds the planet. This dark material settles out of the atmosphere. When washed off high elevations by methane rain, it concentrates at the bottom of the drainage channels and riverbeds contributing to the dark areas seen in DISR images.

New, stunning evidence based on finding atmospheric argon 40 indicates that Titan has experienced volcanic activity generating not lava, as on Earth, but water ice and ammonia.

Thus, while many of Earth's familiar geophysical processes occur on Titan, the chemistry involved is quite different. Instead of liquid water, Titan has liquid methane. Instead of silicate rocks, Titan has frozen water ice. Instead of dirt, Titan has hydrocarbon particles settling out of the atmosphere, and instead of lava, Titanian volcanoes spew very cold ice.



Titan's Varied Terrain: This composite was produced from images returned January 14, 2005, by the European Space Agency's Huygens probe during its successful descent to land on Titan. It shows the boundary between the lighter-colored uplifted terrain, marked with what appear to be drainage channels, and darker lower areas. These images were taken from an altitude of about 8 kilometers (about 5 miles) and a resolution of about 20 meters (about 65 feet) per pixel. The images were taken by the Descent Imager/Spectral Radiometer, one of two NASA instruments on the probe. Credit: ESA/NASA/ Univ. of Arizona

Titan is an extraordinary world having Earth-like geophysical processes operating on exotic materials in very alien conditions.

"We are really extremely excited about these results. The scientists have worked tirelessly for the whole week because the data they have received from Huygens are so thrilling. This is only the beginning, these data will live for many years to come and they will keep the scientists very very busy", said Jean-Pierre Lebreton, ESA's Huygens Project Scientist and Mission manager.

The Cassini-Huygens mission is a cooperation between NASA, ESA and ASI, the Italian space agency. The Jet Propulsion Laboratory (JPL), a division of the California Institute of Technology in Pasadena, is managing the mission for NASA's Office of Space Science, Washington DC. JPL designed, developed and assembled the Cassini orbiter while ESA operated the Huygens atmospheric probe.

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Upcoming Events

March 3rd — 6th: Fort McKavett Star Party

April 6th — 10th: Ring of Fire Panama Annular Solar Eclipse Tour

May 1st — 8th: Texas Star Party

Family Space Day
At The Lunar Planetary Institute

This month's Family Space Day, as you may imagine, focused on Saturn. Families got to build a model of Saturn as well as cut out pieces of Saturn, color them and place them on a black background. One kid decided to place the rings as if they had spun off into space. That would be quite a meteor shower if it ventured this way (actually the rings are slowly falling into Saturn). Coloring really helped the kids focus on the stripes on the planet. The models were beautifully adorned with pounds of glitter, as was the floor of the room. I think I'll loan them my robot vacuum next time.

My thanks go out to the good folks at the Lunar Planetary Institute for setting out all this stuff for us and cleaning up afterwards.

There was also a video describing the Cassini-Huygens mission, and more coloring in the Great Room.

Attendance seemed pretty mild, but we did show up very late. If you know any kids who may be interested, send them out to Family Space Day. FSD is a bunch of fun and it's free. You can't beat that.

Till next month,
Matt Hommel.

All images by Matt Hommel

Rice School Star Party

Lisa Lester

A big thank you to Ed and Eleta Malewitz and David Haviland for coming out and sharing their love of the skies with the students at The Rice School! Our first star party of 2005 was a success. I looked at the skies around 5 p.m. and decided not to bother with a go/no-go message, as the skies were basically clear and nothing loomed in the distance in any direction. I finished running errands and grabbed a Subway for dinner. After dinner, I loaded up the scope and checked out the skies in my neighborhood, looking good, just one or two little clouds.

As I drove into Houston I had time to spot a cloud or two but that was it. When I got off 610 and the traffic slowed down on Kirby, I looked up and saw lots of clouds. When I got to the school, I looked up and became depressed; the sky was totally socked in with just the tiniest sucker holes. David Haviland and I decided to set up our scopes anyway. Ed and Eleta were already putting their scope together when we arrived.

Luckily, the Moon was a pretty good size and the clouds weren't too dense. So, we were able to view the Moon and only have it totally covered occasionally. This group of clouds was very fast moving and by 7:20 we had some sky back. By 7:30, you couldn't see any clouds! We were able to show the students Saturn and Orion's Nebula. The students were very excited and appreciative as were their parents.

The school coordinator of this event is new and the contacts he had from last year never responded to his request for help. He found Ed's e-mail over the holidays and Ed forwarded the request to me. This is an annual event, so we will plan to help them out again. Next year, we should have plenty of time to get the word out about this event.

Thanks again to everyone who helped out on this event.

2005 Star Party Dates

February 12	Moody Gardens
March 3-6	Fort McKavett
April 9	Haak Winery
April 16	Challenger 7 (unconfirmed)
August 13	Moody Gardens
September 10	Challenger 7
September 29 – October 2	Fort McKavett
November 5	Haak Winery
November 12	Moody Gardens

JSCAS also supports Armand Bayou Nature Center’s Krauss Observatory. JSCAS member, Ron Rosenwald, will hold public star parties at the nature center on the following Saturdays: March 12, March 26, and April 16. These star parties begin at 7:00 p.m. Anybody who wants to come commune with nature and "wild children" is welcome.

Fort McKavett Star Party Update

Ken Lester

During my January 18th trip to Fort McKavett to help out with the Huff Wagon Train, I had a chance to get an update from park Superintendent, Buddy Garza, about the fort's power problems. As most of you are no doubt already aware, the fort lost A/C power to all structures except the maintenance building and the Garza residence.

As with most government agencies, getting repairs going has been extremely slow. However, a contract has been signed and repairs should begin in mid February. TP&W has decided to attempt to horizontally bore through the limestone instead of trenching. Once all the holes have been bored, the new electrical wires will be run through the bored holes to the buildings. The project is not expected to be complete before our star party in March.

The horizontal boring technique requires that a pit be dug at every direction change. Buddy assured me that these pits will be roped off and covered with plywood and would not be a safety hazard. Concerning safety, there was an accident involving an adult trail ride support person falling between the porch and the wheel chair ramp at the Park Headquarters at night. Although we have never had a problem at our star parties, it is imperative that due diligence be taken to insure your own safety while attending the star party. Get to know the lay of the land during the day, especially the location of the boring pits. If you are new to the fort, be sure to get to know how ruins, steps and porches are laid out so there will be no unpleasant surprises at night.

Since the repairs will not be completed until after our star party, some adjustments will need to be made by us. The boring will begin at the site of the park host RV site. This means that the three RV spots with hook ups across from Buddy's house will not be available. I was told that the small white camper located between the showers and the maintenance building would be moved so one, possibly two, RVs could share the hookups at that location. We have permission to use the three RV hookups at the new firehouse located about a quarter mile from the park. The firehouse has electricity and water. There is also a way to dump your holding tanks there. Buddy also mentioned that it may be possible to put some RVs over near the Episcopal church, with electric hookups from the church, no water or sewer.

As far as services to RVs near the ruins goes, only water will be available. Buddy has no objections to running RV generators; however, because of the noise factor on sleeping astronomers, we should discuss this option at our February meeting. As far as having A/C on the observing field, Randy has volunteered two generators for our use. I'm not sure that the power output from the generators will be clean enough for CCD, telescope control or laptops. There will be no power to run coffee pots, lamps, or electric blankets in the barracks, or in your tents.

Although this star party will not have all the comforts we are used to at the fort, the staff is doing the best they can to accommodate us. They have been trying to do their own work around the power failure for many months now. I for one, will not let the electrical problems spoil my stay at the fort and am ready to make due with what we have available.

Spitzer Finds Stellar 'Incubators' with Massive Star Embryos

For Release: January 12, 2005

NASA's Spitzer Space Telescope has uncovered a hatchery for massive stars.

The Spitzer image of the Trifid Nebula (l) reveals areas of intense star formation with its infrared eyes. The image on the right was taken by club member Randy Brewer and is shown for comparison.

A new striking image (left) from the infrared telescope shows a vibrant cloud called the Trifid Nebula dotted with glowing stellar "incubators." Tucked deep inside these incubators are rapidly growing embryonic stars, whose warmth Spitzer was able to see for the first time with its powerful heat-seeking eyes.

The new view offers a rare glimpse at the earliest stages of massive star formation -- a time when developing stars are about to burst into existence.

"Massive stars develop in very dark regions so quickly that is hard to catch them forming," said Dr. Jeonghee Rho of the Spitzer Science Center, California Institute of Technology, Pasadena, Calif., principal investigator of the recent observations. "With Spitzer, it's like having an ultrasound for stars. We can see into dust cocoons and visualize how many embryos are in each of them."

The new false-color image can be found at http://www.spitzer.caltech.edu/Media. It was presented today at the 205th meeting of the American Astronomical Society in San Diego, Calif.

The Trifid Nebula is a giant star-forming cloud of gas and dust located 5,400 light-years away in the constellation Sagittarius. Previous images taken by the Institute for Radioastronomy millimeter telescope in Spain show that the nebula contains four cold knots, or cores, of dust. Such cores are "incubators" where stars are born. Astronomers thought the ones in the Trifid Nebula were not yet ripe for stars. But, when Spitzer set its infrared eyes on all four cores, it found that they had already begun to develop warm stellar embryos.

"Spitzer can see the material from the dark cores falling onto the surfaces of the embryonic stars, because the material gets hotter as gravity draws it in," said Dr. William T. Reach of the Spitzer Science Center, co-author of this new research. "By measuring the infrared brightness, we can not only see the individual embryos but determine their growth rate."

The Trifid Nebula is unique in that it is dominated by one massive central star, 300,000 years old. Radiation and winds emanating from the star have sculpted the Trifid cloud into its current cavernous shape. These winds have also acted like shock waves to compress gas and dust into dark cores, whose gravity caused more material to fall inward until embryonic stars were formed. In time,

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the growing embryos will accumulate enough mass to ignite and explode out of their cores like baby birds busting out of their eggs.

Because the Trifid Nebula is home to just one massive star, it provides astronomers a rare chance to study an isolated family unit. All of the newfound stellar embryos are descended from the nebula's main star. Said Rho, "Looking at the image, you know exactly where the embryos came from. We use their colors to determine how old they are. It's like studying the family tree for a generation of stars."

Spitzer discovered 30 embryonic stars in the Trifid Nebula's four cores and dark clouds. Multiple embryos were found inside two massive cores, while a sole embryo was seen in each of the other two. This is one of the first times that clusters of embryos have been observed in single cores at this early stage of stellar development.

"In the cores with multiple embryos, we are seeing that the most massive and brightest of the bunch is near the center. This implies that the developing stars are competing for materials, and that the embryo with the most material will grow to be the largest star," said Dr. Bertrand Lefloch of Observatoire de Grenoble, France, co-author of the new research.

Spitzer also uncovered about 120 small baby stars buried inside the outer clouds of the nebula. These newborns were probably formed around the same time as the main massive star and are its smaller siblings.

Other authors of this work include Dr. Giovanni Fazio, Smithsonian Astrophysical Observatory, Cambridge, Mass.

NASA's Jet Propulsion Laboratory, Pasadena, Calif., manages the Spitzer Space Telescope mission for NASA's Science Mission Directorate, Washington, D.C. Science operations are conducted at the Spitzer Science Center, Pasadena, Calif. JPL is a division of Caltech.

The new Spitzer image is a combination of data from the telescope's infrared array camera and multiband imaging photometer. The infrared array camera was built by NASA Goddard Space Flight Center, Greenbelt, Md.; its development was led by Fazio. The multiband imaging photometer was built by Ball Aerospace Corporation, Boulder, Colo., the University of Arizona, Tucson, and Boeing North American, Canoga Park, Calif. The instrument's development was led by Dr.George Rieke, University of Arizona.

Additional information about the Spitzer Space Telescope is available at:
http://www.spitzer.caltech.edu.

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Spitzer Sees Dusty Aftermath of Pluto-Sized Collision

For Release: January 10, 2005

Astronomers say a dusty disk swirling around the nearby star Vega is bigger than earlier thought. It was probably caused by collisions of objects, perhaps as big as the planet Pluto, up to 2,000 kilometers (about 1,200 miles) in diameter.

NASA's Spitzer Space Telescope has seen the dusty aftermath of this "run-in." Astronomers think embryonic planets smashed together, shattered into pieces and repeatedly crashed into other fragments to create ever-finer debris. Vega's light heats the debris, and Spitzer's infrared telescope detects the radiation.

Vega, located 25 light-years away in the constellation Lyra, is the fifth brightest star in the night sky. It is 60 times brighter than our Sun. Observations of Vega in 1984, with the Infrared Astronomical Satellite, provided the first evidence for dust particles around a typical star. Because of Vega's proximity and because its pole faces Earth, it provides a great opportunity for detailed study of the dust cloud around it.

"Vega's debris disk is another piece of evidence demonstrating the evolution of planetary systems is a pretty chaotic process," said the lead author of the study, Dr. Kate Su of the University of Arizona, Tucson, Ariz. The findings were presented today at the 205th meeting of the American Astronomical Society in San Diego.

Like a drop of ink spreading out in a glass of water, the particles in Vega's dust cloud don't stay close to the star long. "The dust we are seeing in the Spitzer images is being blown out by intense light from the star," Su said. "We are witnessing the aftermath of a relatively recent collision, probably within the last million years."

Scientists say this disk event is short-lived. The majority of the detected material is only a few microns in size, 100 times smaller than a grain of Earth sand. These tiny dust grains leave the system and dissipate into interstellar space on a time scale less than 1,000 years. "But there are so many tiny grains," Su said. "They add up to a total mass equal to one third of the weight of our moon."

The mass of these short-lived grains implies a high dust-production rate. The Vega disk would have to have an improbably massive reservoir of planet-building material and collisions to maintain this amount of dust production throughout the star's life (350 million years, 13 times younger than our Sun). "We think a transient disk phenomenon is more likely," Su said.

Su and her colleagues were struck by other characteristics of Vega's debris disk, including its physical size. It has a radius of at least 815 astronomical units, roughly 20 times larger than our solar system. One astronomical unit is the distance from Earth to the Sun, which is 150million kilometers (93- million miles). A study of the disk's surface brightness indicates the presence of an inner hole at a radius of 86 astronomical units (twice the distance between Pluto and the Sun). Large embryonic planets at the edge of this inner hole may have collided to make the rest of the debris around Vega.

"Spitzer has obtained the first high spatial-resolution infrared images of Vega's disk," said Dr. Michael Werner, co-author and project scientist for Spitzer at NASA's Jet Propulsion Laboratory, Pasadena, Calif. "Its sensitive infrared detectors have allowed us to see that Vega is surrounded by

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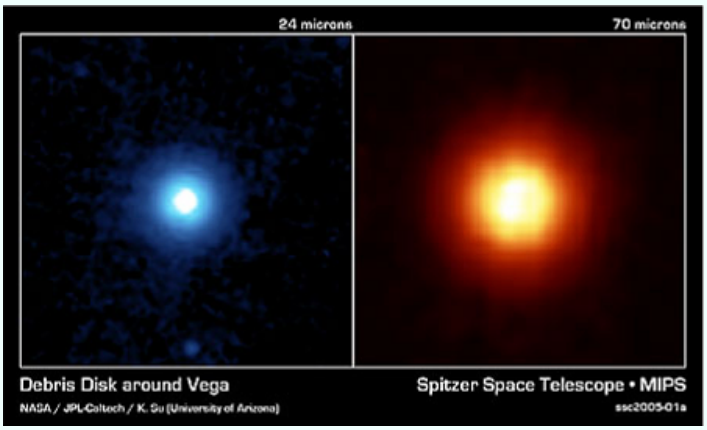

an enormous disk of debris."

JPL manages the Spitzer Space Telescope mission for NASA's Science Mission Directorate, Washington. Science operations are conducted at the Spitzer Science Center at the California Institute of Technology in Pasadena. JPL is a division of Caltech. The multi-band imaging photometer for Spitzer, which made the new disk observations, was built by Ball Aerospace Corporation, Boulder, Colo.; the University of Arizona; and Boeing North American, Canoga Park, Calif.

Additional information about the Spitzer Space Telescope is available at:
http://www.spitzer.caltech.edu.

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Saturn's Moon Iapetus Shows a Bulging Waistline

Press Release: 2005-005, January 7, 2005

Images returned by NASA's Cassini spacecraft cameras during a New Year's Eve flyby of Saturn's moon Iapetus (eye-APP-eh-tuss) show startling surface features that are fueling heated scientific discussions about their origin.

One of these features is a long narrow ridge that lies almost exactly on the equator of Iapetus, bisects its entire dark hemisphere and reaches 20 kilometers high (12 miles). It extends over 1,300 kilometers (808 miles) from side to side, along its midsection. No other moon in the solar system has such a striking geological feature. In places, the ridge is comprised of mountains. In height, they rival Olympus Mons on Mars, approximately three times the height of Mt. Everest, which is surprising for such a small body as Iapetus. Mars is nearly five times the size of Iapetus.

Images from the flyby are available at http://saturn.jpl.nasa.gov, http://www.nasa.gov/cassini and http://ciclops.org .

Iapetus is a two-toned moon. The leading hemisphere is as dark as a freshly-tarred street, and the white, trailing hemisphere resembles freshly-fallen snow.

The flyby images, which revealed a region of Iapetus never before seen, show feathery-looking black streaks at the boundary between dark and bright hemispheres that indicate dark material has fallen onto Iapetus. Opinions differ as to whether this dark material originated from within or outside Iapetus. The images also show craters near this boundary with bright walls facing towards the pole and dark walls facing towards the equator.

Cassini's next close encounter with Iapetus will occur in September 2007. The resolution of images from that flyby should be 100 times better than the ones currently being analyzed. The hope is that

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the increased detail may shed light on Iapetus' amazing features and the question of whether it has been volcanically active in the past.

With a diameter of about 1,400 kilometers (890 miles), Iapetus is Saturn's third largest moon. It was discovered by Jean-Dominique Cassini in 1672. It was Cassini, for whom the Cassini-Huygens mission is named, who correctly deduced that one side of Iapetus was dark, while the other was white.

The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency and the Italian Space Agency. The Jet Propulsion Laboratory, a division of the California Institute of Technology in Pasadena, manages the Cassini-Huygens mission for NASA's Science Mission Directorate, Washington, D.C. The Cassini orbiter and its two onboard cameras were designed, developed and assembled at JPL. The European Space Agency built and manages the development of the Huygens probe and is in charge of the probe operations. The Italian Space Agency provided the high-gain antenna, much of the radio system and elements of several of Cassini's science instruments. The imaging team is based at the Space Science Institute, Boulder, Colo.

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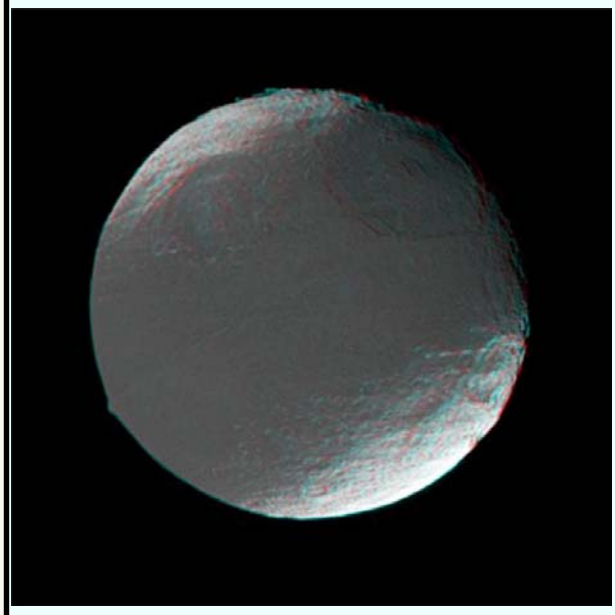
Iapetus in 3D

January 7, 2005 Full-Res: PIA06169

This stereo view of Iapetus was created by combining two Cassini images, which were taken one day apart. The view serves mainly to show the spherical shape of Iapetus and some of the moon's topography.



Credit: NASA/JPL/Space Science Institute
Red/blue glasses required.

The prominent linear ridge in the center of the dark area -- a place known as Cassini Regio -- marks the equator quite closely. The ridge was first discovered in this set of images and was seen at higher resolution in images taken during Cassini's flyby of Iapetus on New Year's Eve 2004. Some Cassini imaging scientists have suggested that the ridge may have a causal relationship to the dark material that coats the moon's leading hemisphere. The mountain on the left is part of the ridge, and rises at least 13 kilometers (8 miles) above the surrounding terrain.

The large basin near the terminator (at upper right) was detected in Cassini images from July and has a diameter of about 550 kilometers (340 miles). The large basin at upper left was newly detected in these images. The crater at far right (within the bright terrain) was known from the

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days of NASA's Voyager missions. North on Iapetus is towards the upper left. The images were obtained in visible light with the Cassini spacecraft narrow angle camera on Dec. 26 and 27, 2004. Cassini's distance from Iapetus ranged from 880,537 to 716,678 kilometers (547,140 to 445,323 miles) between the two images, and the Sun-Iapetus-spacecraft, or phase, angle changed from 21 to 22 degrees. Resolution achieved in the original images was 5.2 and 4.3 kilometers (3.2 and 2.7 miles) per pixel, respectively.

The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency and the Italian Space Agency. The Jet Propulsion Laboratory, a division of the California Institute of Technology in Pasadena, manages the mission for NASA's Science Mission Directorate, Washington, D.C. The Cassini orbiter and its two onboard cameras were designed, developed and assembled at JPL. The imaging team is based at the Space Science Institute, Boulder, Colo.

For more information about the Cassini-Huygens mission visit http://saturn.jpl.nasa.gov. For images visit the Cassini imaging team home page http://ciclops.org.

Credit: NASA/JPL/Space Science Institute

Opportunity Rover Finds an Iron Meteorite on Mars

January 19, 2005

NASA's Mars Exploration Rover Opportunity has found an iron meteorite, the first meteorite of any type ever identified on another planet.

The pitted, basketball-size object is mostly made of iron and nickel according to readings from spectrometers on the rover. Only a small fraction of the meteorites fallen on Earth are similarly metal-rich. Others are rockier. As an example, the meteorite that blasted the famous Meteor Crater in Arizona is similar in composition.

Iron Meteorite On Mars: Credit NASA/JPL/Cornell

"This is a huge surprise, though maybe it shouldn't have been," said Dr. Steve Squyres of Cornell University, Ithaca, N.Y., principal investigator for the science instruments on Opportunity and its twin, Spirit.

The meteorite, dubbed "Heat Shield Rock," sits near debris of Opportunity's heat shield on the surface of Meridiani Planum, a cratered flatland that has been Opportunity's home since the robot landed on Mars nearly one year ago.

"I never thought we would get to use our instruments on a rock from someplace other than Mars," Squyres said. "Think about where an iron meteorite comes from: a destroyed planet or planetesimal that was big enough to differentiate into a metallic core and a rocky mantle."

Rover-team scientists are wondering whether

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some rocks that Opportunity has seen atop the ground surface are rocky meteorites. "Mars should be hit by a lot more rocky meteorites than iron meteorites," Squyres said. "We've been seeing lots of cobbles out on the plains, and this raises the possibility that some of them may in fact be meteorites. We may be investigating some of those in coming weeks. The key is not what we'll learn about meteorites -- we have lots of meteorites on Earth -- but what the meteorites can tell us about Meridiani Planum."

The numbers of exposed meteorites could be an indication of whether the plain is gradually eroding away or being built up.

NASA Chief Scientist Dr. Jim Garvin said, "Exploring meteorites is a vital part of NASA's scientific agenda, and discovering whether there are storehouses of them on Mars opens new research possibilities, including further incentives for robotic and then human-based sample-return missions. Mars continues to provide unexpected science 'gold,' and our rovers have proven the value of mobile exploration with this latest finding."

Initial observation of Heat Shield Rock from a distance with Opportunity's miniature thermal emission spectrometer suggested a metallic composition and raised speculation last week that it was a meteorite. The rover drove close enough to use its Mössbauer and alpha particle X-ray spectrometers, confirming the meteorite identification over the weekend.

Opportunity and Spirit successfully completed their primary three-month missions on Mars in April 2004. NASA has extended their missions twice because the rovers have remained in good condition to continue exploring Mars longer than anticipated. They have found geological evidence of past wet environmental conditions that might have been hospitable to life.

Opportunity has driven a total of 2.10 kilometers (1.30 miles). Minor mottling from dust has appeared in images from the rover's rear hazard-identification camera since Opportunity entered the area of its heat-shield debris, said Jim Erickson of NASA's Jet Propulsion Laboratory, Pasadena, Calif., rover project manager. The rover team plans to begin driving Opportunity south toward a circular feature called "Vostok" within about a week.

Spirit has driven a total of 4.05 kilometers (2.52 miles). It has been making slow progress uphill toward a ridge on "Husband Hill" inside Gusev Crater.

JPL, a division of the California Institute of Technology in Pasadena, has managed NASA's Mars Exploration Rover project since it began in 2000. Images and additional information about the rovers and their discoveries are available on the Internet at http://www.nasa.gov/vision/universe/solarsystem/mer_main.html and at http://marsrovers.jpl.nasa.gov .

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NASA Headquarters, Washington, D.C.
NEWS RELEASE: 2005-018

Opportunity's Heat Shield in Color, Sol 335

NASA Press Release

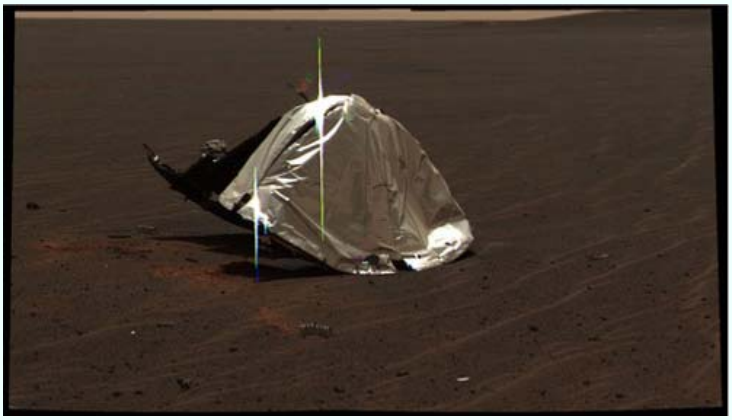


Image credit: NASA/JPL/Cornell

This image from the panoramic camera on NASA's Mars Exploration Rover Opportunity features the remains of the heat shield that protected the rover from temperatures of up to 2,000 degrees Fahrenheit as it made its way through the Martian atmosphere. This two-frame mosaic was taken on the rover's 335th Martian day, or sol, (Jan. 2, 2004).

The view is of the main heat shield debris seen from approximately 10 meters (about 33 feet) away from it. Many rover-team engineers were taken aback when they realized the heat shield had inverted, or turned itself inside out. The height of the pictured debris is about 1.3 meters (about 4.3 feet). The original diameter was 2.65 meters (8.7 feet), though it has obviously been deformed. The Sun reflecting off of the aluminum structure accounts for the vertical blurs in the picture.

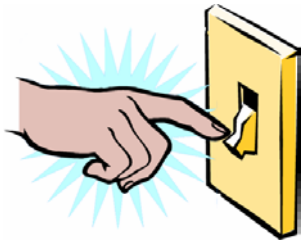
The fact that the heat shield is now inside out makes it more challenging to evaluate the state of the thermal protection system that is now on the inside. In coming sols, Opportunity will investigate the debris with its microscopic imager.

Engineers who designed and built the heat shield are thrilled to see the hardware on the surface of Mars. This provides a unique opportunity to look at how the thermal protection system material survived the actual Mars entry. Team members hope this information will allow them to compare their predictions to what really happened.

This is an approximately true-color rendering, generated using the panoramic camera's 600, 530 and 480 nanometer filters.

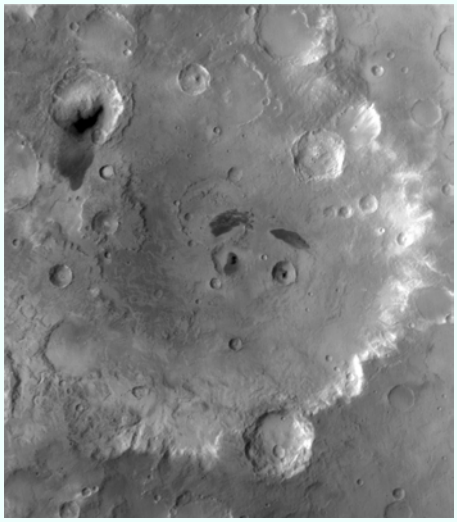
Help turn off the lights...

Join the
International Dark-Sky Association (IDA)
http://www.darksky.org
"To preserve and protect the nighttime environment and our heritage of dark skies through quality outdoor lighting."



Tikhonravov's Eyebrows

MGS MOC Release No. MOC2-958, 1 January 2005



This red wide angle Mars Global Surveyor (MGS) Mars Orbiter Camera (MOC) image shows Tikhonravov Crater in central Arabia Terra. The crater is about 386 km (240 mi) in diameter and presents two impact craters at its center that have dark patches of sand in them, giving the impression of pupils in two eyes. North (above) each of these two craters lies a dark-toned patch of surface material, providing the impression of eyebrows. M. K. Tikhonravov was a leading Russian rocket engineer in the 20th Century. The crater named for him, despite its large size, is still partly buried, on its west side, beneath the heavily cratered terrain of Arabia Terra. The center of Tikhonravov is near 13.5°N, 324.2°W. Sunlight illuminates the scene from the upper left.

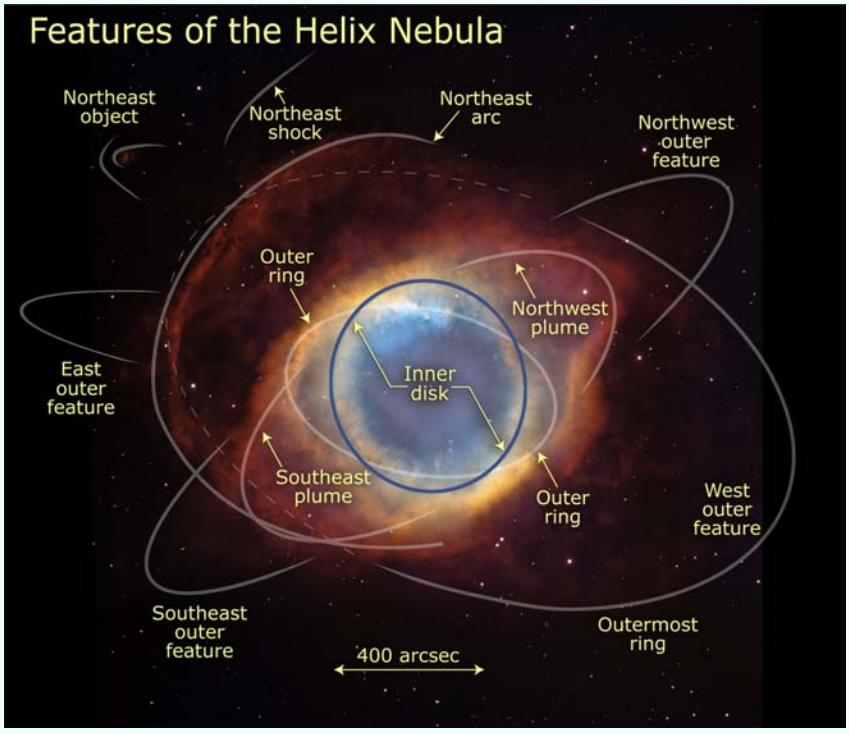
Mars Global Surveyor
Mars Orbiter Camera

A New Twist on an Old Nebula

Release Date: 10:00AM (EST) December 16, 2004
Release Number: STScI-2004-32

Looks can be deceiving, especially when it comes to celestial objects like galaxies and nebulas. These objects are so far away that astronomers cannot see their three-dimensional structure. The Helix Nebula, for example, resembles a doughnut in colorful images. Earlier images of this complex object — the gaseous envelope ejected by a dying, sun-like star — did not allow astronomers to precisely interpret its structure. One possible interpretation was that the Helix's form resembled a snake-like coil.

Credit: NASA, ESA, and A. Feild (STScI)



Now, a team of astronomers using observations from several observatories, including NASA's Hubble Space Telescope, has established that the Helix's structure is even more perplexing. Their evidence suggests that the Helix consists of two gaseous disks nearly perpendicular

(Continued on page 17)

(Continued from page 16)
to each other.

A team of astronomers, led by C. Robert O'Dell of Vanderbilt University in Nashville, Tenn., made its finding using highly detailed images from the Hubble telescope's Advanced Camera for Surveys, pictures from Cerro Tololo Inter-American Observatory in Chile, and measurements from ground-based optical and radio telescopes which show the speed and direction of the outflows of material from the dying star. The Helix, the closest planetary nebula to Earth, is a favorite target of professional and amateur astronomers. Astronomers hope this finding will provide insights on how expelled shells of gas from dying stars like our Sun form the complex shapes called planetary nebulas. The results are published in the November issue of the Astronomical Journal.

"Our new observations show that the previous model of the Helix was much too simple," O'Dell said. "About a year ago, we believed the Helix was a bagel shape, filled in the middle. Now we see that this filled bagel is just the inside of the object. A much larger disk, resembling a wide, flat ring, surrounds the filled bagel. This disk is oriented almost perpendicular to the bagel. The larger disk is brighter on one side because it is slamming into interstellar material as the entire nebula moves through space, like a boat plowing through water. The encounter compresses gas, making that region glow brighter. But we still don't understand how you get such a shape. If we could explain how this shape was created, then we could explain the late stages of the most common form of collapsing stars."

"To visualize the Helix's geometry," added astronomer Peter McCullough of the Space Telescope Science Institute in Baltimore, Md., and a member of O'Dell's team, "imagine a lens from a pair of glasses that was tipped at an angle to the frame's rim. Well, in the case of the Helix, finding a disk inclined at an angle to a ring would be a surprise. But that is, in fact, what we found."

Another surprise is that the dying star has expelled material into two surrounding disks rather than the one thought previously to be present. Each disk has a north-south pole, and material is being ejected along those axes. "We did not anticipate that the Helix has at least two axes of symmetry," O'Dell said. "We thought it had only one. This two-axis model allows us to understand the complex appearance of the nebula."

Using the Helix data, the astronomers created a three-dimensional model showing the two disks. These models are important to show the intricate structure within the nebula. The team also produced a composite image of the Helix that combines observations from Hubble's Advanced Camera for Surveys and the 4-meter telescope's mosaic camera at Cerro Tololo. The Helix is so large that the team needed both telescopes to capture a complete view. Hubble observed the Helix's central region; the Cerro Tololo telescope, with its wider field of view, observed the outer region.

The team, however, is still not sure how the disks were created, and why they are almost perpendicular to each other. One possible scenario is that the dying star has a close companion star. Space-based X-ray observations provide evidence for the existence of a companion star. One disk may be perpendicular to the dying star's spin axis, while the other may lie in the orbital plane of the two stars.

The astronomers also believe the disks formed during two separate epochs of mass loss by the dying star. The inner disk was formed about 6,600 years ago; the outer ring, about 12,000 years ago. The inner disk is expanding slightly faster than the outer disk. Why did the star expel matter at two different episodes, leaving a gap of 6,000 years? Right now, only the Helix Nebula knows the answer, the astronomers said.

The sun-like star that sculpted the Helix created a beautiful celestial object. Will the Sun weave such

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a grand structure when it dies 5 billion years from now? "As a single star, it will create a similar glowing cloud of expelled material, but I wouldn't expect it to have such a complex structure as the Helix," McCullough said.

To study the intricate details of these celestial wonders, astronomers must use a range of observatories, including visible-light and radio telescopes. Astronomers also need the sharp eyes of Hubble's Advanced Camera for Surveys. "The Hubble's crisp vision has revealed a whole new realm of planetary nebula structure, which has advanced the field and delighted our eyes," said team member Margaret Meixner of the Space Telescope Science Institute.

For more information, please contact:
Dr. C. Robert O'Dell, Vanderbilt University, Physics and Astronomy, Box 1807, Station B, Nashville, TN 37235, (phone) 615-343-1779, (e-mail) cro@orion.phy.vanderbilt.edu

Donna Weaver
Space Telescope Science Institute, Baltimore, MD
David Salisbury
Vanderbilt University, Nashville, TN

Invitation to Participate in Cen-Tex Astronomy Weekend

The Austin Astronomical Society is hosting the Cen-Tex Astronomy Weekend April 15-16 at the Eagle Eye Observatory in Canyon of the Eagles Lodge and Nature Park.

The AAS would like to invite your group to participate either by conducting an activity, volunteering in key areas such as serving as docents during the talks, or just joining us in the fun.

We have lined up two great speakers. Dr. Steve Maran, author of "Astronomy for Dummies" and many other books will give a great astronomy talk for all ages and levels. Ann Micklos, an engineer working to return the space shuttle to flight, will be illustrating her wonderful astrophotography taken with Dave Brown plus telling us about the progress to get the shuttles flying again.

In addition to this there will be two nights of viewing (rain plans include talks or showing videos). On Saturday April 16, National Astronomy Day, we will have activities ranging from a scale model of the solar system to storytellers sharing the star stories of yesteryear. Below is the full schedule:

Friday:	2:00 to 6:00	AAS Set-up
	8:30 to 11:00	Star Party
Saturday:	Noon to 4:00	Activities at the Observatory
	4:00 to 5:00	BREAK—wrap up activities
	5:00 to 7:30	Featured Keynote speakers in the Education Building (Live Oak Room): Steve Maran and Ann Micklos
	7:30 to 8:30:	BREAK—dinner
	8:30 to midnight	Star Party

Volunteer Appreciation Party—details to be determined

Please let us know by March 10th if you would like to participate. You can send a response to Kelley Knight, Events Chairperson, at centex@austinastro.org. We will have a website up soon for the event but if you want to find out about the largest Central Texas astronomy club and our wonderful little observatory, please visit http://www.austinastro.org.

Astronomy 101
Solar Observing Equipment

Ken Lester

From the dawn of modern time, mothers have chastised their children not to look at the Sun. For good reason: staring at the Sun can damage your eyes, permanently. Catching the briefest glimpse of the Sun through an unprotected telescope can cause blindness. Scary thought to say the least.

But there is hope for those who want to observe our nearest star. There are a variety of filters that can be purchased for reasonable sums of money that will allow you to safely view the Sun. White-light filters effectively block out 99.999% of the Sun's light, allowing very good views of sunspots, faculae, and limb darkening. There is a very good review of white-light solar filters in the February 2005 issue of *Sky & Telescope* (page 102).

When selecting a white-light filter for your telescope, it is critical that you select one that goes over the exterior end of your telescope. Solar filters that screwed onto the back of your eyepiece were once manufactured and some may still be around. These filters are extremely dangerous and risky to use. Since they lie at the point of focus of the Sun's rays, they get extremely hot and can shatter, instantly letting in blinding light straight to the eye. Since your finder scope will not be covered by a filter, it must be covered to prevent accidental eye injury.

Coronado and some other manufacturers now sell white-light binoculars. I have purchased Coronado's BinoMite™ 10x25 Solar white-light binoculars. They have excellent adjustments for inter-pupil spacing and large oversized eye cups. They took some getting used to. Finding the Sun was the first challenge. I also had a tendency to press the eyecups too close to my face to block out light leak. When I did this however, I quickly fogged up the eyepieces. Once I was familiar with the binoculars, they preformed very well, giving fairly decent resolution of large sunspots. I purchased my BinoMite from Adorama, a mail order house, for $89.00.

To locate the Sun, there is a small, round window on top of the scope that shows the Sun as a bright disk of light. Center the disk in the window, look through the eyepiece and there's the Sun.

For those who want to observe the Sun's chromosphere (prominences, filaments, and plages), a hydrogen-alpha filter, which can cost thousands of dollars, must be purchased. Most of us don't have that kind of money to spend on viewing the Sun. However, there is an alternative. Coronado now sells the PST (Personal Solar Telescope) for around $500 with eyepiece included. The PST has a built-in hydrogen alpha filter and a wonderful, extremely easy to use pointing device that makes finding the Sun fast and simple.

The PST comes with a 12mm Kellner eyepiece. I have tried other eyepieces and have set aside a couple of my eyepieces to use with this scope: a 13mm Tele Vue Plössl and a 9.7 Meade Super Plössl. Both seem to work very well.

The PST has two basic controls. The first is the focus knob built into the rear of the telescope. The

(Continued on page 20)

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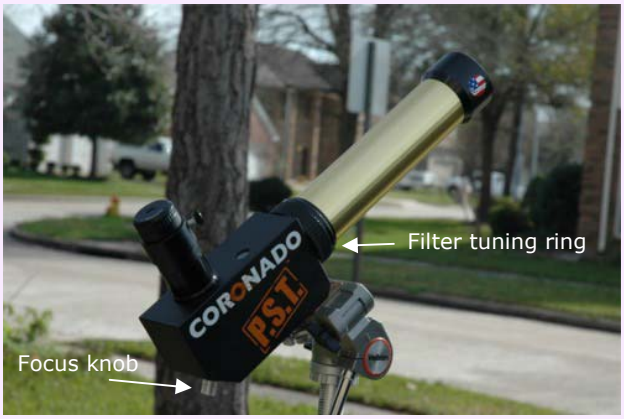
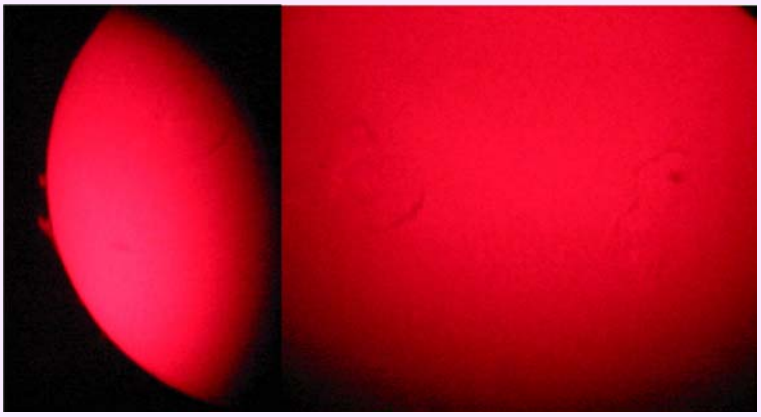
second is a large ring at the back of the bronze tube that is used to tune the hydrogen alpha filter. My personal experience with the scope has been very satisfactory. While the eyepiece that comes with the scope shows the entire Solar disk, I usually have to move the scope such that an edge of the disk is centered in the eyepiece before I can see prominences. Tuning the filter definitely helps bring out the different features. The tuning knob should always be tweaked to get the most from this scope.



One thing I have noticed is that the longer I stare through the eyepiece, the more details I see. This surprised me. My very first look through the scope showed a prominence, but it wasn't until I really started looking at the center of the Sun's disk and tweaked that tuning knob before the other features started to come alive.

I really like this scope and believe it is worth the investment. Both *Sky & Telescope* (February 2005) and *Astronomy* magazine (January 2005) have reviews of the PST. The *Sky & Telescope* review mentioned ghosting of the images in the 3 PST scopes tested. *Astronomy* said that their test showed no ghosting. I have not noticed any ghosting in mine.



This month's Astronomy 101 reads more like product reviews than a tutorial on astronomy basics. However, Solar filters, Solar binoculars, and the PST are a relative low cost entry into Solar observing. Just remember, the key to Solar observing is BE SAFE!

First images taken A-focally with Canon A10 through the PST.

Sky & Telescope and now Astronomy Magazine Subscriptions – Don't Forget about the Club Discount!

Sky & Telescope offers a "Club Discount" on subscriptions. You can subscribe to Sky and Telescope for $10 off the normal price ($32.95 with the club discount). Astronomy magazine is also offering a club discount. JSCAS members can subscribe to Astronomy for $29 a year. We need to have a minimum of five subscribers to take advantage of the discount. I need **four** more people to sign up. If you are a current subscriber, *please* contact me so I can put you on the list for the club discount when your subscription is due for renewal!

Contact me by the email listed on the JSCAS web site, catch me at a meeting, or send your check and renewal form to my home address: 2407 Elkton Ct., Pearland, TX, 77584. I'll put your renewal in the mail within 48 hours after I receive it.

David Haviland
Vice-president and Secretary

A Message From Eleta

I just want to say thank you to everyone in JSCAS for your get-well wishes, and especially to those of you who helped us out at home while I was in the hospital and to those of you who donated blood. Thanks for your cards, visits, and e-mails -- they really did help make the hospital less depressing. You guys are the greatest!

Eleta Malewitz

Member Recognition

Becky Ramotowski, former JSCAS President, was elected vice-president of the Albuquerque Astronomical Society. Her contributions to amateur astronomy are to be commended. Our congratulations to Becky. Like many of our members, Becky is a member of many astronomy clubs. Despite living in New Mexico, she remains a member of JSCAS and regularly attends the Fort McKavett Star Party.

Becky Ramotowski's Comet Machholz image appeared on www.spaceweather.com on January 11th.

The March issue of Sky & Telescope features a discussion about asteroid occultations and includes a partial silhouette (page 71) of 8 Flora drawn from data observed last October 29th during the occultation of a 9th magnitude star. Paul Maley observed the occultation and was credited along with four other people for their input.

Need More Astronomy?

Other Houston Area Astronomy Clubs

Brazosport Astronomy Club
Meets the Third Tuesday of the month, 7:45 p.m.
At the Planetarium
400 College Drive
Clute, Texas
For more information, contact Judi James at the Planetarium
979-265-3376

Fort Bend Astronomy Club http://www.fbac.org/
Meets the third Friday of the month, 7:00 p.m.
First Colony Conference Center
3232 Austin Pkwy
Sugar Land, Texas

Houston Astronomical Society http://spacibm.rice.edu/~has/
Meets the first Friday of the month, 8:00 p.m.
University of Houston, University Park
Science and Research Building, room 117

North Houston Astronomy Club http://www.astronomyclub.org/
Meets the fourth Friday of the month, 7:30 p.m.
In the Teaching Theater at Kingwood College
20000 Kingwood Drive
Kingwood, Texas

Summer Educator Fieldtrip/Workshop Announcement

Life at the Limits: Earth, Mars, and Beyond

The Lunar and Planetary Institute invites you to join an Earth-bound exploration of astrobiology on July 10-17, 2005!

Life at the Limits: Earth, Mars, and Beyond is a NASA-sponsored training workshop for middle-and high-school science teachers (others welcome, including pre-service teachers, informal educators, education specialists, early college instructors, and junior college instructors). At field sites in Nevada and California participants will investigate some extreme geological and chemical conditions in which life on Earth can thrive. This hands-on, real-world experience will enhance classroom teaching about earth and space science, especially about what organisms need to survive and the search for past and present extraterrestrial life. Astrobiologists and planetary scientists will lead the field and laboratory experiences, helping to connect the field observations with the search for life in our solar system and beyond through discussions and proven, hands-on, standards-based class-room and laboratory activities that are ready to share with students!

For more information and to access the on-line application, please visit:
http://www.lpi.usra.edu/education/fieldtrips/2005/

Applications Due: March 23, 2005

Meredith A. Higbie, SCORE Assistant Director
Lunar and Planetary Institute
Education Department
Houston, TX 77058
Office: 281.486.2175
higbie@lpi.usra.edu

Visual Observing for October 2004

Chris Randall

Due to a heavy workload, Chris' picks will be presented at the February meeting. However, go out and start observing Saturn and its moons as I will be concentrating on these objects for February.

Observing At Danciger

Ken Lester

At our January meeting, Al Kelly invited everyone out to the Danciger Observatory to view through the 32". About a dozen people showed up for some fun times looking at new and familiar objects. If you have never looked through the 32", you don't know what you've missed. I would not pass up the invitation if another opportunity presents itself.

Our thanks to Al for being a gracious host and celestial tour guide.

Image by Randy Brewer

MEMBER'S GALLERY

Large Sunspot Group
©Richard Nugent

Taken January 16, 2005 with a William Optics 80mm spotting scope.

The Sun in Hα
©Randy Brewer

Image taken on 1/24/2005. Typical stacking of a dual exposure shot with the Canon 10D & Solaris Scope.

The Moon
©Ken Lester

Taken January 20, 2005 with a Nikon D70 digital camera and a 75~300 mm Nikkor lens set to 300mm. ISO 250, f6.3, 1/200 sec exposure. Image was cropped.

Thor's Helmet
©Randy Brewer

A strange nebula in Canis Major. Taken on December 10, 2004 at Ft. Davis, Texas using a 6" f/5 Takahashi FCT-150 and SBig ST-10XME with Don Goldman's LRGB filters. Exposure times were 120 (L) 20 (R) 20 (G) 20 (B) minutes.

M-42
©Chris Wells

Taken 1/08/05, League City, Texas with an LX200 12". Two 8 sec images taken with a Meade DSI. Since the DSI takes composite color images in 1 shot, each shot is split into separate RGB channels when the "fts" file format was chosen. Images were stacked in AIP4WIN and RGB channels were combined in Photo-shop. An unsharpen mask was applied to an image that clearly showed the E and F stars of the Trapezium so that image would include both nebula and the 6 trapezium stars.

Johnson Space Center Astronomical Society

An association of amateur astronomers dedicated to the study and enjoyment of astronomy. Membership is open to anyone wishing to learn about astronomy.

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CCD Imaging
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Leslie Eaton
Telescope Making
Bob Taylor
Deep Sky Observing
Chris Randall

February Meeting Agenda

February 11th, 7:30 p.m., Center for Advanced Space Studies/Lunar Planetary Institute, 3600 Bay Area Blvd. (at Middlebrook Drive).

- Welcome!!!
- Guest Speaker — Dr. Stephen Mackwell from LPI: The Saturn Cassini Mission
- Break
- SIG reports, Star Party News
- Astronomical Oddities — Hernan Contreras
- Last Words, Door Prizes

Any unfinished discussions can be continued over food and beverages at a location to be announced at the end of the meeting.

Starscan Submission Procedures

Original articles of astronomical interest will be accepted up to 6 P.M. February 25th.

The most convenient way to submit articles or a Calendar of Events is by electronic mail, however computer diskettes or CDs will also be accepted. All articles should include author's name and phone number. Also include any picture credits. The recommended format is Microsoft Word. Text files will also be accepted.

Submitter bears all responsibility for the publishing of any e-mail addresses in the article on the World Wide Web.

Editor's electronic address is: lesteke@swbell.net. Be sure to include the word Starscan in the subject line for proper routing of your message.

Starscan Staff

Editor	Assistant Editors
Ken Lester	Sheila Steele
	Ken Steele

Cover Image
Mosaic of River Channel and Ridge Area on Titan
ESA/NASA/JPL/University of Arizona

This mosaic of three frames from the Huygens DISR instrument provides unprecedented detail of the high ridge area including the flow down into a major river channel from different sources.

http://photojournal.jpl.nasa.gov/catalog/PIA07236