and he it is who created the night and the day and the sun and the moon; all (orbs) travel along swiftly in their celestial spheres

Holy Qur'an 21:33

ASTRONOMICAL RESEARCH CENTER (A. R. C.)

Issue 9

Rabiul-aval 12, 1428
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A. R. C. NEWS

Latest Astronomical News on the Internet

Inside This Issue :

In the most comprehensive survey of its kind, the team looked for disks in 69 binary systems between about 50 and 200 light-years away from Earth.

Planets found thriving around stellar twins

Astronomers using NASA's Spitzer Space Telescope have observed that planetary systems - dusty disks of asteroids, comets and possibly planets - are at least as abundant in twin-star systems as they are in those, like our own, with only one star. Since more than half of all stars are twins, or binaries, the finding suggests the universe is packed with planets that have two suns. Sunsets on some of those worlds would resemble the ones on Luke Skywalker's planet, Tatooine, where two fiery balls dip below the horizon one by one.

Previously, astronomers knew that planets could form in exceptionally wide binary systems, in which stars are 1,000 times farther apart than the distance between Earth and the sun, or 1,000 astronomical units. Of the approximately 200 planets discovered so far outside our solar system, about 50 orbit one member of a wide stellar duo.

The new Spitzer study focuses on binary stars that are a bit more snug, with separation distances between zero and 500 astronomical units. Until now, not much was known about whether the close proximity of stars like these might affect the growth of planets. Standard planet-hunting techniques generally don't work well with these stars, but, in 2005, a NASA-funded astronomer found evidence for a planet candidate in one such multiple-star system.

Trilling and his colleagues used Spitzer's infrared, heat-seeking eyes to look not for planets, but for dusty disks in double-star systems. These so-called debris disks are made up of asteroid-like bits of leftover rock that never made it into rocky planets. Their presence indicates that the process of building planets has occurred around a star, or stars, possibly resulting in intact, mature planets.

In the most comprehensive survey of its kind, the team looked for disks in 69 binary systems between about 50 and 200 light-years away from Earth. All of the stars are somewhat younger and more massive than our middle-aged sun. The data show that about 40 percent of the systems had disks, which is a bit higher than the frequency for a comparable sample of single stars. This means that planetary systems are at least as common around binary stars as they are around single stars.

In addition, the astronomers were shocked to find that disks were even more frequent (about 60 percent) around the tightest binaries in the study. These coziest of stellar companions are between zero and three astronomical units apart. Spitzer detected disks orbiting both members of the star pairs, rather than just one. Extra-tight star systems like these are where planets, if they are present, would experience Tatooine-like sunsets.

The Spitzer data also reveal that not all binary systems are friendly places for planets to form. The telescope detected far fewer disks altogether in intermediately spaced binary systems, between three to 50 astronomical units apart. This implies that stars may have to be either very close to each other, or fairly far apart, for planets to arise.

March 31, 2007
jpl.nasa.gov

Double Asteroids Revealed as Twin Piles of Rubble

One of the most interesting observations happened in 2005, when astronomers around the world focused on the pair during a mutual eclipse or occultation.

Astronomers have turned up many binary asteroids in the Solar System. Instead of a single, solitary spacerock, you've got two objects orbiting a common centre of gravity. A new paper published in the 2007 issue of the journal Icarus focuses on one of these double objects: the binary asteroid 90 Antiope.

As late as the year 2000, astronomers didn't even know 90 Antiope was a double object. But powerful new telescopes, such as the 10 metre Keck II observatory in Hawaii was able to use its adaptive optics system to split them up. More recent observations with the European Southern Observatory's 8-metre Very Large Telescope have taken the observations to the next level.

The observatory has helped to reveal 90 Antiope as two egg-shaped piles of rubble orbiting one another. Each asteroid is roughly 86 km (53 miles) in diameter, and they're separated by only 171 kilometres (106 miles).

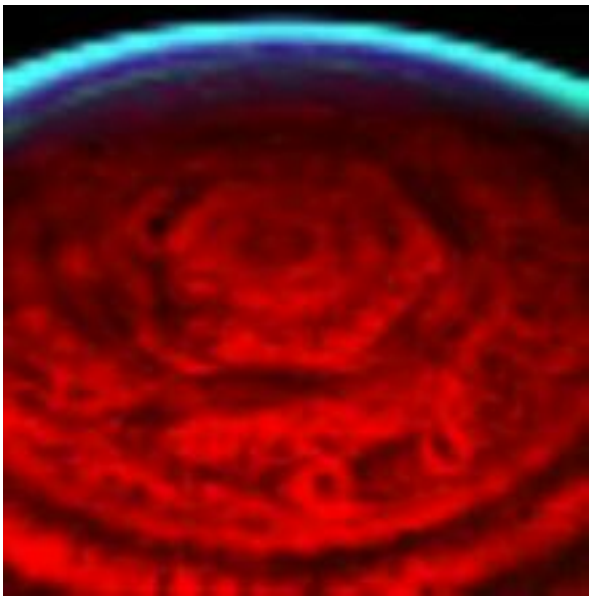
One of the most interesting observations happened in 2005, when astronomers around the world focused on the pair during a mutual eclipse or occultation.

During this period, the shadow from one asteroid was expected to fall on the other, darkening their combined brightness. Right on schedule on May 31, 2005 the eclipse occurred, and astronomers were able to measure it accurately.

March 30, 2007
www.berkeley.edu

Hexagonal Structure at Saturn's North Pole

This cloud structure is similar to the Earth's polar vortices, but instead of being circular, the clouds have build up this hexagonal shape. The hexagon extends much deeper than scientists previously believed, reaching 100 km (60 miles) below the cloud tops. Whatever this feature is, it's only at the north pole.



New Cassini infrared images of Saturn have revealed one of its strangest features - a bizarre six-sided cloud structure circling the entire north pole. This structure was hinted at when the Voyager spacecraft first visited the planet more than 20 years ago, but the new images from Cassini really show the structure in detail.

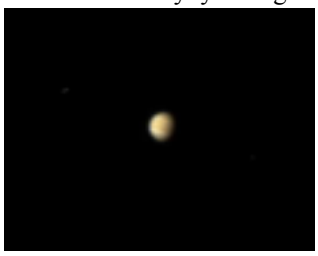
This cloud structure is similar to the Earth's polar vortices, but instead of being circular, the clouds have build up this hexagonal shape. The hexagon extends much deeper than scientists previously believed, reaching 100 km (60 miles) below the cloud tops. Whatever this feature is, it's only at the north pole. The south pole has a large storm, but it looks more like a hurricane with a giant eye.

Cassini hadn't been able to image Saturn's north pole until now because it was in winter in that area. This image was taken in the infrared spectrum, so it's just variations in heat. Just like the Earth's north pole, the region doesn't see sunlight for a long time; in Saturn's case, it takes 15 years of darkness. Saturn is moving out of its winter, now, and the region should be visible to Cassini's other instruments.

Why has this cloud shape formed? That's still a mystery.

March 30, 2007
saturn.jpl.nasa.gov

Jupiter As Seen From Saturn



The brick red, white and brown cloud bands of Jupiter are seen here from Saturn orbit. The Cassini spacecraft's powerful imaging cameras were specially designed to photograph nearby bodies (cosmically speaking) in the Saturn system, but as this image demonstrates, the cameras are actually telescopes.

Jupiter is imaged here from more than 11 times the distance between Earth and the Sun, or slightly farther than the average Earth-Saturn distance. As demonstrated by Pale Blue_Orb, Earth is only about a pixel across when viewed from Saturn by Cassini.

Cassini's parting glance at Jupiter, following the spacecraft's 2000 flyby and gravity assist, is Cassini's Farewell to Jupiter. Images taken using red, green and blue spectral filters were combined to create this natural color view. The images were taken with the Cassini spacecraft narrow-angle camera on Feb. 8, 2007 at a distance of approximately 1.8 billion kilometers (1.1 billion miles) from Jupiter and at a Sun-Jupiter-spacecraft, or phase, angle of 50 degrees. Scale in the original image was about 10,000 kilometers (6,000 miles) per pixel. The image was contrast enhanced and magnified by a factor of two and a half to enhance the visibility of cloud features on the planet.

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 operations center is based at the Space Science Institute in Boulder, Colo.

March 19, 2007
saturn.jpl.nasa.gov

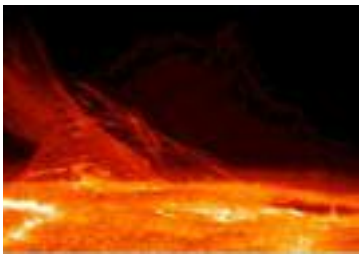
The Cassini-Huygens mission is a cooperative project of NASA, the European Space Agency and the Italian Space Agency. The Jet Propulsion Laboratory, a division of the California Institute of Technology in Pasadena, manages the mission for NASA's Science Mission Directorate, Washington, D.C.

Hinode's Amazing New Images of the Sun's Surface

Hinode, Japanese for "sunrise," was launched Sept. 23, 2006, to study the sun's magnetic field and how its explosive energy propagates through the different layers of the solar atmosphere. The spacecraft's uninterrupted high-resolution observations of the sun will have an impact on solar physics comparable to the Hubble Space Telescope's impact on astronomy.

"For the first time, we are now able to make out tiny granules of hot gas that rise and fall in the sun's magnetized atmosphere," said Dick Fisher, director of NASA's Heliophyics Division, Science Mission Directorate, Washington. "These images will open a new era of study on some of the sun's processes that effect Earth, astronauts, orbiting satellites and the solar system."

Hinode's three primary instruments, the Solar Optical Telescope, the X-ray Telescope and the Extreme Ultraviolet Imaging Spectrometer, are observing the different layers of the sun. Studies focus on the solar atmosphere from the visible surface of the sun, known as the photosphere, to the corona, the outer atmosphere of the sun that extends outward into the solar system. "By coordinating the measurements of all three instruments, Hinode is showing how changes in the structure of the magnetic field and the release of magnetic energy in the low atmosphere spread outward through the corona and into interplanetary space to create space weather," said John Davis, project scientist from NASA's Marshall Space Flight Center, Huntsville, Ala.



Space weather involves the production of energetic particles and emissions of electromagnetic radiation. These bursts of energy can black out long-distance communications over entire continents and disrupt the global navigational system.

"Hinode images are revealing irrefutable evidence for the presence of turbulence-driven processes that are bringing magnetic fields, on all scales, to the sun's surface, resulting in an extremely dynamic chromosphere or gaseous envelope around the sun," said Alan Title, a corporate senior fellow at Lockheed Martin, Palo Alto, Calif., and consulting professor of physics at Stanford University, Stanford, Calif.

March 21, 2007
www.nasa.gov

"For the first time, we are now able to make out tiny granules of hot gas that rise and fall in the sun's magnetized atmosphere,"

Seas Discovered on Titan

Instruments on NASA's Cassini spacecraft have found evidence for seas, likely filled with liquid methane or ethane, in the high northern latitudes of Saturn's moon Titan. One such feature is larger than any of the Great Lakes of North America and is about the same size as several seas on Earth.

Cassini's radar instrument imaged several very dark features near Titan's north pole. Much larger than similar features seen before on Titan, the largest dark feature measures at least 100,000 square kilometers (39,000 square miles). Since the radar has caught only a portion of each of these features, only their minimum size is known. Titan is the second largest moon in the solar system and is about 50 percent larger than Earth's moon.

"We've long hypothesized about oceans on Titan and now with multiple instruments we have a first indication of seas that dwarf the lakes seen previously," said Dr. Jonathan Lunine, Cassini interdisciplinary scientist at the University of Arizona, Tucson.

While there is no definitive proof yet that these seas contain liquid, their shape, their dark appearance in radar that indicates smoothness, and their other properties point to the presence of liquids. The liquids are probably a combination of methane and ethane, given the conditions on Titan and the abundance of methane and ethane gases and clouds in Titan's atmosphere.

Cassini's visual and infrared mapping spectrometer also captured a view of the region, and the team is working to determine the composition of the material contained within these features to test the hypothesis that they are liquid-filled.

The imaging cameras, which provide a global view of Titan, have imaged a much larger, irregular dark feature. The northern end of their image corresponds to one of the radar-imaged seas. The dark area stretches for more than 1,000 kilometers (620 miles) in the image, down to 55 degrees north latitude. If the entire dark area is liquid-filled, it would be only slightly smaller than Earth's Caspian Sea. The radar data show details at the northern end of the dark feature similar to those seen in earlier radar observations of much smaller, liquid-filled lakes. However, to determine if the entire dark feature is a liquid-filled basin will require investigation through additional radar flyovers later in the mission.

The presence of these seas reinforces current thinking that Titan's surface must be resupplying methane to its atmosphere, the original motivation almost a quarter century ago for the theoretical speculation of a global ocean on Titan.

Cassini's instruments are peeling back the haze that shrouds Titan, showing high northern latitudes dotted with seas hundreds of miles across, and hundreds of smaller lakes that vary from several to tens of miles.

Due to the new discoveries, team members are re-pointing Cassini's radar instrument during a May flyby so it can pass directly over the dark areas imaged by the cameras.

March 13, 2007
saturn.jpl.nasa.gov

Cassini's radar instrument imaged several very dark features near Titan's north pole. Much larger than similar features seen before on Titan, the largest dark feature measures at least 100,000 square kilometers(39,000 square miles).

A Very Long Lasting Gamma Ray Burst

Gamma ray bursts are some of the most energetic events in the Universe. Even more amazing is just how quickly it all unfolds. One moment, everything's quiet. A moment later, there's a tremendous explosion that we can see from billions of light years away. And just seconds later, it's gone again - the afterglow will be around for a few days, but that's it. Astronomers and spacecraft have only a few seconds to a few minutes to find the explosion and study it before it fades away. But a recent burst started off so bright, and faded so slowly, that astronomers were able to study it for months. The burst is called GRB 060729, and it was first discovered on July 29, 2006 by NASA's Swift Satellite. Since it lasted so long, astronomers think the initial explosion might have been receiving continuous amounts of energy from some other source.

One possibility is a magnetar; a neutron star with an ultra-powerful magnetic field. The magnetic field acts as a brake, forcing the star to slow down, and transfers energy into the gamma ray burst explosion. This energy could keep the afterglow going for weeks and months.

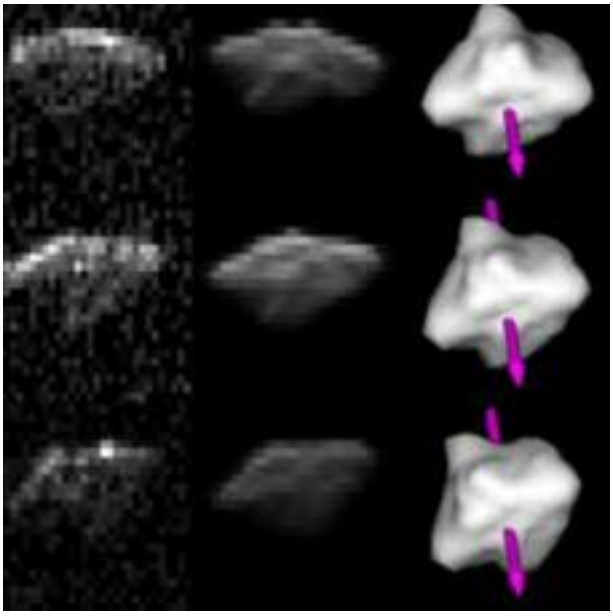
March 13, 2007
www.nasa.gov

But a recent burst started off so bright, and faded so slowly, that astronomers were able to study it for months.

Sunlight Puts the Spin on Asteroids

Astronomers have theorized that light from the Sun influences the speed at which asteroids spin, and now they've gathered the evidence to back it up.

The "Yarkovsky-O'Keefe-Radzievskii-Paddack" (YORP) effect proposed that when sunlight strikes an asteroid's surface, it warms the region up slightly. As the heat is radiated away, there's a recoil effect that causes the asteroid to spin. It's not a lot, but added up over millions of years, it can really set an asteroid spinning.



Now astronomers have found this effect in action on nearby asteroid 2000 PH5. They watched the asteroid using a variety of instruments across the Earth over the course of 4 years. During this period, they were able to measure an increase in its rotation speed. Although it takes 12 minutes to complete one rotation, that period is decreasing by 1 millisecond a year.

They calculated that over the next 35 million years, the rotation period will drop to 20 seconds, and it might end up spinning so fast that it reshapes itself or breaks apart.

March 08, 2007
www.eso.org

The "Yarkovsky-O'Keefe-Radzievskii-Paddack" (YORP) effect proposed that when sunlight strikes an asteroid's surface, it warms the region up slightly.

Radioactive Core Might Explain Geysers on Enceladus

Since Cassini arrived at Saturn, it has made many impressive discoveries. One of the most intriguing is the discovery that Saturn's icy moon Enceladus has geysers spewing water ice into space.

Some planetary scientists theorize that there are pockets of liquid water near the surface of Enceladus that could harbour life. But where is the heat coming from to fuel these geysers?

A new model proposes that the rapid decay of radioactive elements might be keeping the moon hotter than it would normally be. This heat is released through cracks in the moon's surface, and since Enceladus is covered with ice, it has water geysers.

The theory says that Enceladus started out as a ball of ice and rock, with rapidly decaying isotopes of aluminum and iron.

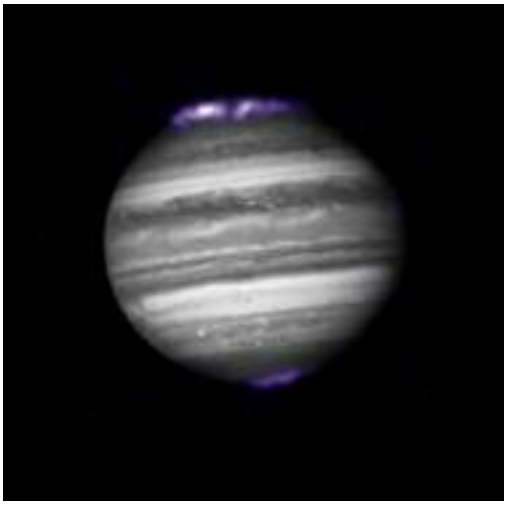
Over the course of just a few million years, this decay produced a tremendous amount of heat, creating a rocky core and a surrounding shell of ice. The moon then slowly cooled over the course of billions of more years.

This theory matches some of the elements seen in Enceladus' geysers, such as gaseous nitrogen, methane, carbon dioxide, propane and acetylene. These could come from the decomposition of ammonia deep inside the moon where the warm core and water meet.

March 13, 2007
jpl.nasa.gov

The theory says that Enceladus started out as a ball of ice and rock, with rapidly decaying isotopes of aluminum and iron.

Chandra and Hubble Imaged Jupiter During New Horizons Flyby



In this new composite image, data from those separate Chandra's observations were combined, and then superimposed on the latest image of Jupiter from the Hubble Space Telescope.

On February 28, 2007, NASA's New Horizons spacecraft made its closest approach to Jupiter on its ultimate journey to Pluto. This flyby gave scientists a unique opportunity to study Jupiter using the package of instruments available on New Horizons, while coordinating observations from both space- and ground-based telescopes including NASA's Chandra X-ray Observatory.

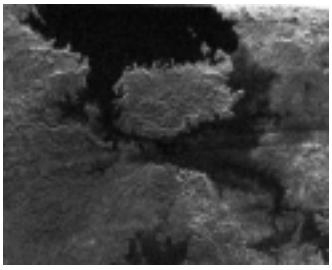
In preparation for New Horizon's approach of Jupiter, Chandra took 5-hour exposures of Jupiter on February 8, 10, and 24th. In this new composite image, data from those separate Chandra's observations were combined, and then superimposed on the latest image of Jupiter from the Hubble Space Telescope.

The purpose of the Chandra observations is to study the powerful X-ray auroras observed near the poles of Jupiter. These are thought to be caused by the interaction of sulfur and oxygen ions in the outer regions of the Jovian magnetic field with particles flowing away from the Sun in the so-called solar wind. Scientists would like to better understand the details of this process, which produces auroras up to a thousand times more powerful than similar auroras seen on Earth.

Following closest approach on the 28th, Chandra will continue to observe Jupiter over the next few weeks. New Horizons will take an unusual trajectory past Jupiter that takes it directly down the so-called magnetic tail of the planet, a region where no spacecraft has gone before. The sulfur and oxygen particles that dominate Jupiter's magnetosphere and originate in Io's volcanoes are eventually lost down this magnetic tail. One goal of the Chandra observations is to see if any of the X-ray auroral emissions are related to this process. By combining Chandra observations with the New Horizons data, plus ultraviolet information from NASA's Hubble Space Telescope and FUSE satellite, and optical data from ground-based telescopes, astronomers hope to get a more complete picture of Jupiter's complicated system of particles and magnetic fields and energetic particles. In the weeks and months to come, astronomers will undertake detailed analysis of this bounty of data.

March 01, 2007
chandra.harvard.edu

Large Lake Surrounds an Island on Titan



The island is about 90 kilometers (62 miles) by 150 kilometers (93 miles) across, about the size of Kodiak Island in Alaska or the Big Island of Hawaii.

This radar image, obtained by Cassini's radar instrument during a near-polar flyby on Feb. 22, 2007, shows a big island smack in the middle of one of the larger lakes imaged on Saturn's moon Titan. This image offers further evidence that the largest lakes are at the highest latitudes.

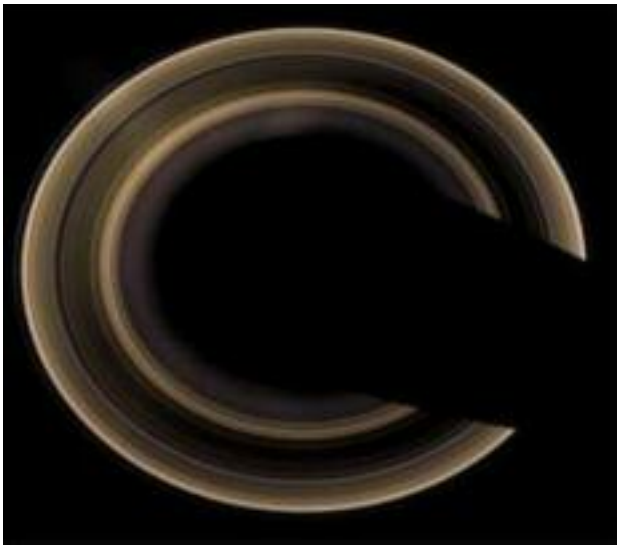
The island is about 90 kilometers (62 miles) by 150 kilometers (93 miles) across, about the size of Kodiak Island in Alaska or the Big Island of Hawaii. The island may actually be a peninsula connected by a bridge to a larger stretch of land. As you go farther down the image, several very small lakes begin to appear, which may be controlled by local topography.

This image was taken in synthetic aperture mode at 700 meter (2,300 feet) resolution. North is toward the left. The image is centered at about 79 north degrees north and 310 degrees west.

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 was designed, developed and assembled at JPL. The radar instrument was built by JPL and the Italian Space Agency, working with team members from the United States and several European countries.

March 01, 2007
jpl.nasa.gov

Unique New Perspectives of Saturn



Now flying in a polar orbit around Saturn, NASA's Cassini spacecraft is now sending back completely unique images of Saturn, seen from overhead. The photograph that I've attached to this story shows Saturn seen from almost directly overhead. The planet itself has been removed, so just the rings are visible. But there are other images taken over the last two months.

As part of this photo release, there are additional images showing the planet at a bit of a lower angle, but still almost looking detached from the rings. There's an animated sequences showing 34 frames when the spacecraft passed through the ring plane. And an overexposed view that shows the detailed structure of the rings themselves.

March 01, 2007
ciclops.org

There's an animated sequences showing 34 frames when the spacecraft passed through the ring plane.

The Perfect Crater for a Moon Settlement?

SMART-1 has investigated lunar areas at the edge of Luna Incognita. This area near the lunar poles can be used for lunar science studies, or even to prepare for human bases on the Moon and on Mars.

Mankind did not see the land called Luna Incognita, until the first probes sent images of the lunar farside.

Plaskett crater sits close to the Moon's north pole, on the edge of Luna Incognita. Plaskett has a diameter of 109 kilometres and displays a central peak. This peak was formed during the crater's formation and is composed of rocks, originally from beneath the Moon's surface, which were melted and thrown up by the impact. As they rose above the surface they 'froze' and formed the peak. By analysing such central peaks, planetary scientists can deduce the vertical composition of the Moon's subsurface regions.

Plaskett crater could play a key role in preparing humans for their eventual journeys to Mars. On such a mission, Earth would dwindle to a point and the astronauts would lose the familiar view of their home planet. From the lunar near side the Earth is a brilliant object, four times wider than the full Moon seen from Earth. The Earth seems to wobble in the sky due to a lunar motion called libration. From the lunar poles libration takes the Earth below the horizon for about half the month.

From Plaskett, on the far side of the Moon, the Earth can only be seen from the crater's northern rim for just a few days during a few months every year.

"A human outpost there, on the edge of Luna Incognita, would allow us to study the effects of Earth-deprivation on a crew in a controlled way," says Bernard Foing, SMART-1's Project Scientist.

"It will allow us to simulate Mars operations and isolation, on the Moon, at a safe distance from a human base at the north pole."

March 01, 2007
www.esa.int

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A. R. C. NEWS
Internal, Scientific, Cultural, latest astronomical news on the Internet

Astronomical Research Center Activities

Some of the activities:

- Educational Facilities
- Research Facilities
- Receive and Transmit Atomic-Clock waves
- Institution of a virtual observatory
- Cosmic radio observation project
- Calculation and distribution of timings of religious duties
- Organizing scientific conferences with invitations to scholars and experts
- Publishing new titles on the field of Astronomy
- Building an observatory and a big planetarium

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SPECIAL REPORT

New Globular Cluster Found in Milky Way

Images made with ESO's New Technology Telescope at La Silla by a team of German astronomers reveal a rich circular cluster of stars in the inner parts of our Galaxy. Located 30,000 light-years away, this previously unknown closely-packed group of about 100,000 stars is most likely a new globular cluster.

Star clusters provide us with unique laboratory conditions to investigate various aspects of astrophysics. They represent groups of stars with similar ages, chemical element abundances and distances. Globular clusters, in particular, are fossils in the Milky Way that provide useful information. With ages of about 10 billion years, they are among the oldest objects in our Galaxy - almost as old as the Universe itself. These massive, spherical shaped star clusters are therefore witnesses of the early, mysterious ages of the Universe.

In our own Galaxy about 150 globular clusters are known, each containing many hundreds of thousands of stars. In contrast to their smaller and less regularly shaped siblings - open clusters - globular clusters are not concentrated in the galactic disc; rather they are spherically distributed in the galactic halo, with increasing concentration towards the centre of the Galaxy. Until the mid 1990s, globular clusters were identified mostly by eye - from visual inspection of photographic plates. However, these early searches are likely to have missed a significant number of globular clusters, particularly close to the disc of the Galaxy, where dense clouds of dust and gas obscure the view. In the early times of extragalactic astronomy this area was called the 'Zone of Avoidance' because extragalactic stellar systems appeared to be very rare in this part of the sky.

Searching for the missing globular clusters in our Galaxy requires observations in the infrared, because infrared radiation is able to penetrate the thick 'galactic fog'. Using modern, sensitive infrared detectors, this is now possible.

Completing the census is not only a challenge for its own sake, as finding new globular clusters is useful for several additional reasons. For example, analysing their orbits allows astronomers to draw conclusions about the distribution of mass in the Galaxy. Star clusters can therefore be used as probes for the large-scale structure of the Milky Way.

The astronomers observed these candidates with the SofI instrument attached to ESO's New Technology Telescope (NTT) at La Silla (Chile), taking images through three different near-infrared filters. The new images are ten times deeper and have a much better angular resolution than the original 2MASS images, thereby allowing the astronomers to resolve at least partly the dense accumulation of stars in the globular cluster candidates.

One of these candidates had the number 1735 in the list of Froebrich, Scholz, and Raftery, and is therefore denoted as FSR 1735.

"The unique images we have obtained reveal that the nebulous appearance of the cluster in previous images is in fact due to a large number of faint stars," says Froebrich. "The images show a beautiful, rich, and circular accumulation of stars."

From a detailed analysis of the properties of the cluster, the astronomers arrive at the conclusion that the cluster is about 30,000 light-years away from us and only 10,000 light-years away from the Galactic Centre, close to the Galactic Plane.

The cluster is about 7 light-years wide (slightly less than twice the distance between the Sun and its nearest star, Proxima Centauri) but contains about 100,000 stars for a total estimated mass of 65,000 times the mass of the Sun. The stars contain between 5 and 8 times less heavy elements than the Sun.

"On its way to our Solar System, the light coming from the stars in the FSR 1735 cluster has to penetrate a thick cloud of dust and gas," says Meusinger. "This is one of the reasons why this cluster was hard to find in previous surveys."

"Is this now the last missing globular cluster in our galaxy?," asks Scholz. "We really can't be sure. The opaque interiors of the Milky Way may well have more surprises in store."

March 13, 2007
www.eso.org