

YOUNG ASTRONOMERS NEWSLETTER

Volume 18 Number 10 **STUDY + LEARN = POWER**

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EGYPTIAN CRATER

Scientists say a meteoric impact crater found in the remote Egyptian desert may be the best-preserved ever found on Earth. The Kamil crater is unlike most Earth impact sites partially or severely eroded, and maintains much of its structure, including the rays of ejected material thrown from the crater when the space rock hit.

Craters this well-preserved are usually only seen on the Moon or Mars. Italian researchers first spotted the 148-foot-wide crater. Scientists think it was caused by the impact of an iron meteorite about 4.3 feet in diameter and traveling at 7,920 mph. See: <http://www.spacedaily.com/images-ig/kamil-crater-egypt-ig.jpg>

ASTRONOMY AND THE FUTURE

In the four centuries since Galileo pointed his handheld cardboard-and-glass telescope skyward and Johannes Kepler described two laws of planetary motion, humans have come to know our solar system almost as intimately as we know our hometowns.

In the 17th and 18th centuries when various solar system bodies were identified and classified, Halley and Herschel characterized comets, and discovered Uranus. Then came the discovery of the asteroid Ceres, the first sensing of infrared and ultraviolet radiation, and the detection of the apparent shift in the position of a star viewed from Earth at different points in orbit.

Exploring the solar system is much like it must have been for the adventurers who came to the New World centuries ago, or when you go traveling - you turn around a corner and you never know what you're going to see or what you're going to learn.

The coming years are likely to bring a deeper understanding of the origin and evolution of the solar system, our place in it, and the worlds beyond it.

SATURN FLYBY

The Cassini spacecraft has returned images from its flyby of Saturn's moons Tethys and Dione, and the light and dark contrasts on the geyser moon Enceladus.

The raw images also include the best ones to date of Penelope crater on Tethys. And Cassini was also able to obtain a portrait of Enceladus's "tiger stripe" fissures at the south polar region. See:

<http://www.spacedaily.com/images-ig/penelope-crater-saturn-moon-tethys-ig.jpg>

RHEA

There are very strong, interesting, and unexplained electromagnetic effects around Saturn's moon Rhea that are not caused by solid material orbiting the moon.

An unknown "something" is causing a strange, ring-like structure around Rhea but it is not a system of rings.

Scientists positioned *Cassini* to view the moon at what would be edge-on to the rings but found none, contrary to a 2008 report.

And the findings reopen the mystery about the cause of the 2008 observations.

TWINKLING STARS

Astronomers say that the twinkling of stars that blanket the sky on a clear summer is extremely annoying. But now a team of University of Arizona astronomers has developed an adaptive mirror technique that allows them to switch off the twinkling over a wide field of view, and enabling Earth-based telescopes to obtain images as crisp as those taken with the *Hubble Space Telescope*.

The mirror has 336 actuators glued to its back that cause the mirror to warp just enough to cancel out the flickering caused by the atmosphere. The corrective movements are too tiny for the human eye to see.

MAGNETAR SUPRISE

In the southern constellation of **Ara** (the Altar), a super star cluster contains hundreds of very massive stars. European astronomers discovered a **magnetar** (an unusual type of neutron star) that was formed from an **Ara** star with at least 40 times as much mass as the Sun. The result presents great challenges to current theories of how stars evolve, as a star as massive as this was expected to become a black hole, not a **magnetar**.

The previous assumption was that stars with initial masses between about 10 and 25 solar masses would form neutron stars and those above 25 solar masses would produce black holes.

GALACTIC RE-BIRTH

A Texas A&M University-led team of astronomers has uncovered what may be the earliest, most distant cluster of galaxies ever detected. The group of roughly 60 galaxies is nearly 10 billion years old and dominated by old, red and massive galaxies, typical of present-day clusters. It is similar to a young version of the Coma Cluster of today, which has had billions of more years to develop.

What is striking is the fact that the stellar birth rate is higher in the cluster's center than at its edges - the exact opposite of what happens in our local portion of the universe.

MARS' DUSTY LAYERS

Mars' north polar has layers of dusty ice up to 2 miles thick and approximately 620 miles in diameter. It is thought that the deposits visible in troughs likely formed as variations in Mars' orbit changed the distribution of water ice around the planet. And ice moved to and from the polar region in response to a changing climate, layers of ice and dust built up at the poles.

CHINA'S MOON PROBES

China will have launched its second lunar probe before the end of 2010. *Chang'e 2* is an orbiting spacecraft that was originally built as a backup for China's first lunar probe, *Chang'e 1* which flew to the Moon in 2007. China also plans to land two types of spacecraft on the surface of the Moon. One will deploy a small rover and another will return lunar rock samples to Earth.

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And planetarium schedules**

HYPERFAST STAR BOOTED FROM MILKY WAY

The Hubble Space Telescope has detected a hypervelocity star, a rare phenomenon moving three times faster than our Sun. A hundred million years ago, a triple-star system came too close to the Milky Way's giant black hole. It captured one of the stars and hurled the other two out of the galaxy where they merged to form a super-hot blue star traveling at incredible speeds. It is one of the fastest ever detected with a speed of 1.6 million mph. See: <http://www.nasa.gov/hubble>

YOUNG STARS

In a new Spitzer image, the **Orion Nebula** is a 'happening' place where a colony of hot, young stars is stirring up the cosmic scene. The young stars dip and peak in brightness; and shifting cold and hot spots on the stars' surfaces cause brightness levels to change. Surrounding disks of lumpy planet-forming material can obstruct starlight. The hottest stars in the region are in the **Trapezium** cluster. See: http://www.nasa.gov/multimedia/imagegallery/image_feature_1722.html

A DRY MOON?

A team of geologists at Caltech and the University of Tennessee found "structurally bound hydroxyl groups" (i.e., water) in a mineral in a lunar rock returned to Earth by the Apollo program

DARK GAMMA-RAY BURST

A research team led by astronomers from Japan used the Subaru Telescope to observe a dark gamma-ray burst (GRB) and found clues to understanding the origin of dark gamma-ray bursts. They not only found that the host galaxy of this GRB is one of the most massive GRB host galaxies but also that a local dusty environment around the GRB significantly suppresses its afterglow. Their research suggests the possibility that GRBs classified as "dark" may originate from another mechanism such as the merger of binary stars.

FEDERATION OF GALAXY EXPLORERS

Twelve-year-old Emily Boyce knows exactly what she wants to do in life. "I want to be the first woman on the moon and the first person on Mars," she said. Emily was one of 54 middle school children who, for one week, joined the **Federation of Galaxy Explorers**. "When I was in fifth-grade I learned about the solar system," she said. "I wanted to come here and study space."

This past school year, Peterson AFB launched the "Adopt A School" program that aims to bring Airmen and civilians from Peterson AFB into the schools as volunteers to tutor, mentor and be involved in special events like space camp. Teachers work together on team projects that center on a space theme.

HUGE SOLAR FLARE

On August 1st, almost the entire Earth-facing side of the Sun erupted in a tumult of activity with a huge solar flare. The flare (white area on upper left), a solar tsunami (wave-like structure, upper right), and multiple filaments of magnetism rose off the Sun's surface, and there was large-scale shaking of the solar corona, radio bursts, a coronal mass ejection and more.

A second solar flare sparked a new round of Northern Lights. See: http://www.nasa.gov/multimedia/imagegallery/image_feature_1732.html

A GALACTIC SPECTACULAR

The Antennae galaxies collision started almost 100 million years ago and has triggered the formation of countless stars in clouds of dust and gas in the galaxies. The most massive of these young stars have already exploded in supernovas. See: http://www.nasa.gov/mission_pages/chandra/multimedia/antennae.html

ISLAND UNIVERSE

A new *Hubble* image shows a majestic face-on spiral galaxy located deep within the Coma Cluster of galaxies in the northern constellation **Coma Berenices**.

The galaxy, (NGC 4911), contains rich lanes of dust and gas near its center. These are silhouetted against glowing newborn star clusters and iridescent pink clouds of hydrogen, the existence of which indicates ongoing star formation. *Hubble* has also captured the outer spiral arms of NGC 4911, along with thousands of other galaxies of varying sizes. See: http://www.nasa.gov/multimedia/imagegallery/image_feature_1739.html

EARLY BACTERIA?

A lake in Argentina's remote, inhospitable northwest may offer clues on how life got started on Earth and how it could survive on other planets. Researchers have found millions of "super" bacteria thriving inside the oxygen-starved Lake Diamante, in the center of a giant volcanic crater located over 15,400 feet above sea level.

The bacteria's habitat is similar to primitive Earth, before living and breathing organisms began wrapping a protective atmosphere of oxygen around the planet. The conditions -- which include high arsenic and alkaline levels -- could also shed light on life beyond Earth.

A NEW LIFE?

In aged, massive galaxies that seem to have a second lease on life, astronomers found mysterious, great shining rings of ultraviolet light with ripples, some stretching 250,000 light-years. Somehow these "over-the-hill galaxies" have been infused with fresh gas to form new stars that power the gargantuan rings, some of which could encircle several Milky Way galaxies.

The discovery implies that bloated galaxies presumed "dead" and devoid of star-making can be re-ignited with star birth, and that galaxy evolution does not proceed straight from the cradle to the grave.

TARANTULA NEBULA

Astronomers scanning the skies as part of ESO's VISTA Magellanic Cloud survey have now obtained a spectacular picture of the **Tarantula Nebula** in the **Large Magellanic Cloud**. This panoramic near-infrared view captures the nebula itself in great detail as well as the rich surrounding area of sky. See:

<http://www.spacedaily.com/images-lg/vista-magellanic-cloud-survey-tarantula-nebula-lg.jpg>

NOVA GRB

The *Fermi Gamma-ray* spacecraft detected gamma-rays from a nova for the first time, a finding that stunned observers and theorists alike. The discovery overturns the notion that novae explosions lack the power to emit such high-energy radiation. A nova is a sudden, short-lived brightening of an otherwise inconspicuous star.

The outburst occurs when a white dwarf in a binary system erupts in an enormous thermonuclear explosion.

HYPATIA

The new movie *Agora* is the story of the life, challenges and death of Hypatia, a 4th Century woman astronomer whose contributions influenced and shaped modern science and our understanding of the world and the universe.

When Hypatia was born, her father, Theon, was a professor of mathematics and astronomy in Alexandria. He believed, as many Greeks did, that it was possible to raise a perfect human being. So he gave his daughter the best possible education, including studies in mathematics, languages, rhetoric, and science.

Upper-class women of the time were usually secluded, expected to devote themselves solely to their husband and children, but Hypatia found a job at the most famous institution in the ancient world, the library at Alexandria.

She taught mathematics, physics, and astronomy, and wrote many books about these subjects - thirteen books on algebra, her favorite subject, and another eight books on geometry.

She also designed an astrolabe, an instrument used to measure the positions of the stars, another important tool for sailors, which let them locate specific stars and use the stars' positions for navigation. She used her astrolabe to calculate the positions of specific stars, and then published her data in tables. Sailors and astronomers used her tables of positions of the stars, *Astronomical Canon*, for the next 1200 years.

WR 22

A new image from the La Silla Observatory in Chile shows the brilliant and unusual star **WR 22** in the **Carina Nebula**, and its colorful surroundings. It is a very hot and bright star that is shedding its atmosphere into space at a rate many millions of times faster than the Sun.

Very massive stars live fast and die young. Some of these stellar beacons have such intense radiation passing through their thick atmospheres late in their lives that they shed material into space many millions of times more quickly than relatively sedate stars such as the Sun. See: <http://www.spacedaily.com/images/images-1g/carina-nebula-centred-hot-massive-young-star-wr-22-wolf-rayet-1g.jpg>

NGC 4696

Unusual-looking galaxy **NGC 4696** curls around itself like a question mark. Most likely formed by collisions between spiral galaxies, elliptical galaxies experience a brief burst of star formation triggered as interstellar dust and gas crash into each other, but which quickly leaves the young galaxies exhausted. With no more gas to form new stars from, they gradually grow older and fainter, and are usually little more than shapeless collections of ageing stars.

NGC 4696 is the largest galaxy in the **Centaurus Cluster** and also an elliptical galaxy with a difference. A huge dust lane sweeps across the face of the galaxy but in fact, much of its inner turmoil is still hidden from view in this picture.

At the heart of the galaxy, a supermassive black hole is blowing out jets of matter at nearly the speed of light. See: <http://sci.esa.int/science-e/www/object/index.cfm?fobjectid=47603>

CLOSE BINARY

Astronomers found a very young brown dwarf, or failed star, in a tight orbit around a young nearby Sun-like star.

This discovery special because they are separated by only 18 Astronomical Units (AU = mean distance from Earth to Sun). Most young brown dwarf and planetary companions found by direct observations are at orbital separations greater than 50 AUs.

In addition to the small separation, in just the past year the researchers observed the dwarf star moving quickly outward from its parent star.

PERSEID METEOR

On the night of August 3rd, a Perseid meteor - about 1 inch in diameter and moving at a speed of 134,000 mph - entered the atmosphere 70 miles above the town of Paint Rock, Alabama.

At such a tremendous velocity, the meteor cut a path some 65 miles long, finally burning up just northeast of the town of Warrior. The meteor was about six times brighter than Venus and would be classified as a fireball.

PULSAR DISCOVERY

In the first genuine astronomical discovery by a public volunteer, three citizen scientists have discovered a new radio pulsar hidden in data gathered by the Arecibo Observatory in Chile. It is the first deep-space discovery by **Einstein@Home**, which uses donated time from the home and office computers of 250,000 volunteers from 192 different countries.

The new pulsar, in the constellation **Vulpecula**, is a neutron star that rotates 41 times per second. Unlike most pulsars that spin as quickly and steadily, it sits alone in space, and has no orbiting companion star.

Astronomers consider it interesting since it is likely a recycled pulsar that lost its companion, but it may be a young pulsar born with a lower-than-usual magnetic field.

LUTETIA

ESA's *Rosetta* spacecraft has captured stunning images of asteroid **Lutetia** that raise more questions about asteroids than they answer, scientists say.

Lutetia, at about 62 miles wide, is the largest asteroid yet visited by a spacecraft. "It looked as though it could have been fractured off of a mother asteroid -- it was all angles and flat planes, ancient impacts overlaid by newer ones and covered by dust of some kind. See:

<http://www.spacedaily.com/images-1g/asteroid-lutetia-rosetta-osirus-1g.jpg>

NEW MICROBES FOUND

A deep-diving robot exploring the depths of the world's deepest water-filled sinkhole has found an amazing diversity of microbial life where sunlight can't reach. The discovery re-affirms life's resilience and ability to thrive in extreme environments and possibly on other planets.

The robot dove about 900 feet deep in the Zacaton sinkhole in northeastern Mexico and retrieved samples of water and microbes lining the limestone sinkhole. Among these samples, researchers were able to identify more than 100 types of microbes, including three new divisions of bacteria never before discovered.

The YOUNG ASTRONOMERS Newsletter is distributed by the Forsyth Astronomical Society.

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