
YOUNG ASTRONOMERS NEWSLETTER

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STUDY + LEARN = POWER

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A HOLE IN THE UNIVERSE !

Astronomers have found an enormous hole in the Universe, nearly a billion light-years across, empty of both normal matter such as stars, galaxies, and gas, and the mysterious, unseen "dark matter." While earlier studies have shown holes, or voids, in the large-scale structure of the Universe, this new discovery in the constellation Eridanus dwarfs them all.

EXOPLANETS

Most searches for exoplanets focusing on Sun-like stars have found more than 400 alien worlds. But, Sun-like stars aren't the only potential homes for planets. New research confirms that planet formation is a natural by-product of star formation, even around stars much heftier than the Sun.

The team found that about one-tenth of the constellation Cassiopeia's stars appear to have dusty disks. And 15 showed signs of central clearing, suggesting that newborn Jupiter-sized planets are sucking up material.

SOLAR ECLIPSE

On January 15, a solar eclipse reduced the Sun to a blazing ring surrounding a darkened disk and plunged millions of people in Africa and Asia into an eerie semi-darkness. The spectacle, visible in a roughly 185-mile band running 8,062 miles across the globe, set a record for the longest **annular eclipse** that will remain unbeaten for more than a thousand years.

AN EXOPLANET'S SPECTRUM

For the first time, astronomers have directly detected the light signature (spectrum) of a planet orbiting an almost Sun-like star. Certain molecules that are important to life or a potential sign of it that have been found are carbon dioxide, water vapor, silicate minerals and sodium.

This signature can tell scientists the chemical makeup of the planet, which can help them understand how it formed. In the future, these signatures could be used to look for signs of life on other planets. The planet is a giant, about 10 times as massive as Jupiter, and it orbits between two other giants around a star similar to the Sun in a scaled-up version of the solar system. (A Spectrum describes the rainbow of colors in visible light when separated using a prism.)

"SUNSPOTS" ON BETELGEUSE ?

An image taken of Orion's huge star Betelgeuse has revealed two enormous bright spots near its center - the first direct evidence of Sun-like heat convection on another star. The bright spots are hotter than the surrounding area, indicating regions where heat rises from the interior of the star to its surface, just like on the Sun.

Betelgeuse is shedding the equivalent of one Sun's worth of mass every 10,000 to 100,000 years. It is also expelling a gigantic plume of hot gas that may be related to the convection.

STRANGE BLACK HOLE

An unusual black hole locked in a tight orbit with a huge star in a nearby galaxy could be the most massive stellar black hole known. The black hole has a mass almost 16 times that of the Sun.

An astronomy team also found that the black hole's companion star has a mass about 70 times that of the Sun, making it the most massive star in a binary system containing a black hole.

Researchers can detect the existence of a black hole in a binary system by observing a visible star in orbit around its invisible companion.

NGC 2976

Astronomers were surprised to find that star-formation activities in the outer regions of NGC 2976 shut down millions of years ago. NGC 2976 is a small member in the M81 group of hefty galaxies in **Ursa Major**.

NGC 2976 is a peculiar spiral galaxy, peculiar because of its chaotic inner structure with many dark lanes and stellar condensations in its disk. *Hubble* images show that star formation in the galaxy began fizzling out in its outskirts about 500 million years ago as some of the gas was stripped away and the rest collapsed toward the center.

ENCELADUS

Clumps of warm ice that periodically rise to the surface and churn the icy crust on Saturn's moon Enceladus helps explain the quirky heat behavior and intriguing surface of the moon's south polar region. The region captivates scientists because it hosts fissures known as "tiger stripes" that spray water vapor and other particles out from the moon.

ASTEROID ?

On January 13th, an asteroid with an unusual orbit that frightened astronomers, flew past Earth at a distance of only 80,796 miles. The asteroid was about 32 - 50 feet long and shaped similar to a man-made object. It was suggested that it was a rocket booster, but this has not been confirmed.

An astronomer said that he classified asteroids of over 300 feet in diameter as being dangerous.

SMALLEST KUIPER BELT OBJECT

The *Hubble Space Telescope* has discovered the smallest **Kuiper Belt** object ever seen in visible light. The belt is a vast ring of icy debris encircling the rim of the solar system just beyond Neptune. The smallest **Kuiper Belt Object** seen previously is roughly 30 miles across, or 50 times larger.

Hubble observations of nearby stars show that a number of them have Kuiper Belt-like disks of icy debris encircling them - remnants of planetary formation.

[SciWorks Planetarium - Call 767-6730 for schedules & program information.](#)

WALTZING BLACK HOLES

Astronomers have discovered 33 pairs of waltzing black holes in distant galaxies. It shows that supermassive black hole pairs are more common than previously known, and because the black hole pairs can be used to estimate how often galaxies merge with each other. Nearly every galaxy has a central supermassive black hole (with a mass of a million to a billion times the mass of the Sun), and galaxies commonly collide and merge to form new, more massive galaxies.

A merger between two galaxies should bring two supermassive black holes to the new, more massive galaxy where the black holes move toward the center, engaging in a gravitational tug-of-war with surrounding stars. Such a dance is expected to occur in the Milky Way Galaxy in about 3 billion years, when it collides with the Andromeda Galaxy. See: <http://www.spacedaily.com/images/waltzing-black-holes-bg.jpg>

CLUSTER LOSES A STAR

New images from *Chandra* and the *Hubble Space Telescope* suggest a star in the elliptical galaxy NGC 1399 in the **Fornax** cluster was torn apart by an intermediate-mass black hole in the cluster.

Chandra observations show that this unusual object is a so-called *ultraluminous X-ray source* (ULX) that emit more X-rays than stars, but less than quasars. Their exact nature has remained a mystery, but one suggestion is that some ULXs are black holes with masses between a hundred and a thousands times that of the Sun. See: <http://www.spacedaily.com/images/ngc-1399-bg.jpg>

TITAN

It has been hard to keep up with the flow of discoveries delivered from Saturn's moon Titan to Earth since the *Voyager-1* spacecraft flyby in 1980.

We now know that the 3,200-mile wide world has lakes, riverbeds and even fog at the South Pole. Evaporated liquids create clouds that are carried around the moon by winds -- and probably cause precipitation, not in a water cycle but an exotic climate of hydrocarbons that features methane and ethane.

On Earth, those are gases, but the extremely cold temperature of Titan, around minus 290 degrees F allows them to be liquid as well (and maybe even solid). Since Titan is so similar to our planet, some scientists are asking whether it could even support life. The cold temperature means that chemical reactions occur very slowly, so the chances of life are very slim. Though there might be a chance of life further down in the interior.

KEPLER FINDS EXOPLANETS

The *Kepler Space Telescope* has discovered its first new exoplanets. Known as "hot Jupiters" because of their high masses and extreme temperatures, the five new exoplanets range in size from similar to Neptune to larger than Jupiter.

They have orbits ranging from 3.3 to 4.9 days. Estimated temperatures of the planets range from 2,200 to 3,000 degrees Fahrenheit, hotter than molten lava and much too hot for life as we know it. All of the exoplanets orbit stars hotter and larger than the Sun. See:

<http://www.nasa.gov/kepler>

STRANGE SUPERNOVA

Astronomers have found that a massive, explosive white dwarf star in a binary star system with a Sun-like star in our Milky Way Galaxy is growing in mass and is much closer to our solar system than previously thought.

It is known as a **recurrent nova** because its massive white dwarf star has suffered thermonuclear (nova) explosions approximately every 20 years. Its previous recorded explosions occurring in 1890, 1902, 1920, 1944 and 1967, making it 44 years overdue. Nobody understands why it is has stopped its thermonuclear explosions. See: <http://www.spacedaily.com/images/supernova-t-pyxis-bg.jpg>

MOON TUBE

Japanese scientists said that a deep lava tube discovered on the Moon could shield human colonists from harsh temperatures and meteorites. The tube, in the Marius Hills on the Moon's near side, is believed to be 213-feet wide and more than 260-feet deep. It does not appear prone to collapse and is insulated with a sheet of lava that protects the hole from extreme temperatures and meteorite strikes

NEW RADIO TELESCOPE

The Chinese space agency has started construction of a 65-meter-diameter radio telescope. It will be used in tracking and collecting data from satellites and space probes, including their astronomical projects. It will have a bowl-like surface composed of 1,008 panels that will be as large as eight basketball courts in total area.

EARLY GALAXIES

New *Herschel Space Observatory* images revealed thousands of newly discovered galaxies in their early stages of formation. The newest images are "amazingly clear and deep," which enables astronomers to detect distant galaxies they could not see with ground-based telescopes. The *Herschel* team expects to discover many thousands of new galaxies at very early stages of their formations - some more than 10 billion years old.

THE MILKY WAY'S BLACK HOLE

Astronomers have long known that the fuel for the supermassive black hole at the center of the Milky Way Galaxy (known as Sagittarius A*) comes from powerful winds blown off dozens of massive young stars a large distance away. The gravity of the black hole is weak so the high-velocity winds are difficult for the black hole to consume -.only about .001 %.

There is a supernova remnant nearby, lobes of hot gas extending for a dozen light years on either side of the black hole, and several mysterious X-ray filaments.

See: http://www.nasa.gov/multimedia/imagegallery/image_feature_1559.html and

http://www.nasa.gov/mission_pages/chandra/multimedia/photo10-002.html

NGC 2976

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WISE

NASA's *Wide-field Infrared Survey Explorer*, or *WISE*, has captured its first look at the starry sky that it will soon begin surveying in infrared light. *WISE* will scan the entire sky for millions of hidden objects, including asteroids, "failed" stars and powerful galaxies.

WISE data will serve as navigation charts for other missions such as the *Hubble* and *Spitzer Space Telescopes*, pointing them to the most interesting targets. See: http://www.nasa.gov/mission_pages/WISE/multimedia/wise20100106.html

LAKES ON MARS ?

New images suggest vast lakes of melted ice existed on Mars more recently than previously thought. The lakes might have been habitats for life, if there ever was life on Mars but there is no firm evidence of any Martian biology, past or present.

Based on data from landers, rovers and Mars images taken from orbit, scientists know that water ice exists beneath the Martian surface. See:

<http://www.space.com/php/multimedia/imagegallery/igviewer.php?imgid=1263&gid=99&index=0>

DARK MATTER

Some scientists think the universe is made up of mostly "dark matter" or "dark energy", an unknown, mysterious substance that has no substance, that does not reflect light and is invisible to any known form of observation including infra-red.

They cannot detect it directly -- and say the only way they know it's there is by measuring its gravitational tug on regular matter (planets, stars, dust, etc.).

Over 70 percent of the mass of most galaxies, including the Milky Way, is thought to be made up of "dark matter" that seems to shroud the remaining visible matter in giant spheres called "haloes".

Their new study indicates that the Milky Way's "halo" isn't exactly spherical, but "squished". In fact, its beach-ball form is flattened perpendicular to the galaxy's visible, pancake-shaped spiral disk.

GALILEOSCOPES

Thousands of school children around the country will be able to explore the Moon, planets, and our galaxy thanks to a \$250,000 donation by Ric and Jean Edelman to the American Astronomical Society. It will be used to fund the acquisition and distribution of more than 15,000 **Galileoscopes** to schoolteachers nationwide.

(The **Galileoscope** is a small (2 inch), massively produced refractor telescope, designed with the intention of increasing public interest in astronomy and science. Millions of people can view the same things seen by Galileo -- the craters of Earth's Moon, four of Jupiter's moons, and the Pleiades. Cost is \$12.50 to \$20.00.)

A DIFFERENT STAR

Astronomers at UCLA have discovered a star with an unusual formation of young, rocky planets. In the aftermath of collisions between planetary embryos, the dusty debris bears no resemblance to the planetary building blocks of our own Solar System.

Warm dust found around other stars has been very similar in composition to asteroidal or cometary material in our Solar System.

SMALLEST EXOPLANET ?

Astronomers have discovered the smallest planet and the most-like Earth found to date. The planet may be the rocky remains of a Saturn-size gas giant. It circles its Sun-like star in just 20.4 hours and is located 480 light-years away in the constellation **Monoceros**. They believe the star is about 1.5 billion years old, or about one-third the Sun's age.

The first exoplanets detected were enormous gas giants in very tight orbits around their stars (*hot Jupiters*)

MILLISECOND PULSARS

In the last thirty years only sixty *millisecond pulsars* have been identified in the Milky Way Galaxy. But seventeen new *millisecond pulsars* have been found in just the last three months by using large radio telescopes to target newly found high-energy gamma-rays by the *Fermi Gamma-ray Space Telescope*.

Pulsars are the stellar remnants of massive stars that have ended their lives in a supernova. They are rapidly rotating, super-dense, highly magnetized neutron stars that emit beams of radiation from their magnetic poles. Millisecond pulsars are pulsars that spin with rotational periods of only a few milliseconds. By measuring their rate of pulsation, millisecond pulsars can be used as precise clocks, whose long-term stability is comparable to that of man-made atomic clocks.

SOLAR SYSTEMS

In their quest to find solar systems similar to ours, astronomers have concluded that about 15 percent of stars in our galaxy host systems of planets like our own and the gas giant planets in the outer part of the solar system. In the last four years, a research group called the "MicroFUN Survey" has discovered only one solar system like our own - a system with two gas giants resembling Jupiter and Saturn.

A "SPIKE"

For more than 40 years, a "spike" was thought to be associated with a galaxy, NGC 3303. It has now been identified as the superposed trail of a main-belt asteroid that happened to be crossing the galaxy as it was being photographed.

An amateur astronomer noticed the lack of the "spike" and after researching many images dating back to 1968, the "peculiar galaxy" was found to be normal.

See: <http://www.spacedaily.com/images/galaxy-arp-192-spike-bg.jpg>

EPSILON AURIGAE

For almost two centuries, humans have looked up at a bright star called **Epsilon Aurigae** and watched as it seemed to disappear into the night sky. Another dimming is underway and though astronomers know that **Epsilon Aurigae** is eclipsed by a dark companion object every 27 years, the nature of both the star and object has remained unclear. See: <http://www.citizensky.org>

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