

THE YOUNG ASTRONOMERS NEWSLETTER

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STUDY + LEARN = POWER

November 2014

DAYLIGHT SAVINGS TIME ENDS ON 11/2

AMAZING M 82

Astronomers have found a pulsating, dead star beaming with the energy of about 10 million Suns. It is the brightest **pulsar** (a dense stellar remnant left over from a supernova explosion) ever recorded.

The surprising find is helping astronomers better understand mysterious sources of blinding X-rays, called **ultraluminous X-ray sources** (ULXs). Until now, all ULXs were thought to be black holes. This new data from *NuSTAR* shows that at least one ULX, about 12 million light-years away in the galaxy **Messier 82** (M82), is actually a pulsar.

RECORD-SETTING STELLAR FLARES

On April 23, the *Swift* satellite detected the strongest, hottest, and longest-lasting sequence of stellar flares ever seen.

The initial blast from this record-setting series of explosions from a nearby red dwarf star was as much as 10,000 times more powerful than the largest solar flare ever recorded. At its peak, one of the flares reached temperatures of 360 million° F, -- more than 12 times hotter than the center of the Sun.

SUPERBOLIDE FRAGMENTS

Scientists found meteorite fragments 20 years after a **superbolide** was seen in the skies of the Czech Republic. This discovery was made possible by reanalyzing the trajectory which moved the impact line about 200 feet. The meteorites found on the ground are of different types pointing to a parent asteroid of mixed composition.

LUTETIA'S GROOVES

Grooves found on **Lutetia**, the asteroid encountered by ESA's *Rosetta* spacecraft, point to the existence of a large impact crater on the unseen side of the rocky world.

The spacecraft took images of the 100 km-wide asteroid revealing many impact craters and hundreds of grooves all over the surface. See:

http://www.esa.int/Our_Activities/Space_Science/Rosetta/Lutetia_s_dark_side_hosts_hidden_crater

MIMAS LIBRATES

After carefully examining Saturn's moon Mimas, astronomers found it librates -- that is, it subtly wobbles around its polar axis. The amount of the to-and-fro motion indicates that Mimas' interior is not uniform.

These wobbles can be produced if the moon contains a weirdly shaped, rocky core or if a sub-surface ocean exists beneath its icy shell. A possible internal global internal global ocean may be located under an icy crust 25 to 30 kilometers thick.

SUN'S CORONA

Why is the Sun's million-degree corona, or outermost atmosphere, so much hotter than the Sun's surface? This question has baffled astronomers for decades. A Harvard-Smithsonian team has now found that miniature solar flares called "nanoflares" (and the speedy electrons they produce) might partly be the source of that heat, at least in some of the hottest parts of the Sun's corona.

NGC 4206 IMAGE

A magnificent new image taken with the *Hubble Space Telescope* shows the edge-on spiral galaxy **NGC 4206**, located about 70 million light-years away from Earth in the constellation of Virgo. See:

<http://www.spacetelescope.org/images/potw1440a/>

CHINESE MOON PLANS

In the near future, a rocket will be launched carrying a Chinese spacecraft to the Moon and back. It will be the first time that China has attempted this long and perilous journey and should be a great achievement for the nation. The mission is yet further evidence of Chinese plans for launching astronauts to the Moon and return.

BIG DIPPER'S COSMIC RAYS

University of Utah observatory found a "hotspot" beneath the Big Dipper that is emitting a disproportionate number of the highest-energy cosmic rays. A university scientist says many astrophysicists suspect ultrahigh-energy cosmic rays are generated by **active galactic nuclei**, or AGNs, in which material is sucked into a supermassive black hole at the center of galaxy, while other material is spewed away in a beam-like jet known as a **blazar**.

Another popular theory is that the highest-energy cosmic rays come from some supernovas.

NEW STARS BLOCKED

A new study has found that massive black holes spewing out radio-frequency-emitting particles at near the speed of light can block formation of new stars in aging galaxies. These jets streaming from mature galaxies' black holes prevent hot free gas from cooling and collapsing into baby stars.

"EXOCOMETS"

Astronomers using an ultra-sensitive telescope in the Chilean desert said they had mapped hundreds of comets orbiting a star 63 light years from Earth. The feat marks the most complete census of so-called **exocomets**, or comets in other solar systems.

SCIWORKS -- For information and Planetarium schedules, call 767-6730

The Sky Tonight? <http://www.skymaps.com/downloads.html> and also
http://amazing-space.stsci.edu/tonights_sky/
and http://hubblesite.org/explore_astronomy/tonights.sky

*** Astronomy Picture of The Day - <http://apod.nasa.gov/apod/astropix.html> ***

A STAR WITH MANY ORBITING COMETS

Researchers found 493 **exocomets** in orbit around **Beta Pictoris**, a young star in *Pictor*. There are two distinct families of **exocomets**: one old family whose orbits are controlled by the massive planet and another family, probably arising from the recent breakdown of one or a few bigger objects.

Different families of comets also exist in the Solar System.

Puzzles

Find The Word

S O U T H N E K A T	ALONG	MONTH
P E M N A G A D T H	BUILD	ORBIT
L A B I N T H E I R	DELAY	OUTER
I S D O N D S N B E	DENSE	PHILAE
T N L U L O F S R E	FIRST	SOUTH
I A O I S I R E O E	IMAGE	SPLIT
T M U K R E N A N A	INDIAN	TAKEN
A B A S S E V E N S	LINEAR	THERE
N E T G P H I L A E	LOBES	THREE
P Y A L E D N A N R	MINOR	TITAN

Scrambled Astronomy

THINGS IN SPACE

OSMTCE

UCDSLO

SRIALT

RAORUA

BEDIRS

(Answers on page 4)

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The **YOUNG ASTRONOMERS NEWSLETTER** is on the Internet at:

<http://www.fas37.org> (FAS) and <http://204.200.153.100/pwood/sfair/yan.html> (The Summit School)

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***** INTERNET SITES *****

All about spectacular M11 - <http://messier.seds.org/m/m011.html>

MAVEN News Plus - <http://www.nasa.gov/news/releases/latest/index.html#.VDmblj1dWNA>

SITE OF THE MONTH

"What's Up In Space" - <http://www.spaceweather.com/>

This site has news, images and information about the Sun - Earth Environment and is up-dated continually.

Strongly recommended as a "Keeper" and "Subscribe".

***** MOON IN NOVEMBER *****

Full Moon: 11/6 **Last Quarter:** 11/14 **New Moon:** 11/22 **First Quarter:** 11/29

Perigee: 11/3 8:22 pm 228,584 mi. (367870 km) ** The November Full Moon was called the Frosty

Apogee: 11/14 9:57 pm 251,243 mi. (404336 km) Moon, Hunter's Moon and Beaver Moon.

Perigee: 11/27 9:12 pm 229,798 mi. (369824 km) ** **Best observing nights:** 11/14 – 11/30

***** PLANETS IN NOVEMBER *****

VENUS, MERCURY and **SATURN** are too close to the Sun for observations. **JUPITER** is high in the E in the pre-dawn hours. **MARS** is low in the SSW at dusk and sets three hours after sunset. **URANUS** is SE of Pegasus's Great Square. The faint blue disc (with telescopes and binoculars) is at a distance equal to the size of the Square. **NEPTUNE** is 1.5 times the Square's size to the SW.

***** METEOR SHOWERS *****

<u>NAME</u>	<u>DATES</u>	<u>BEST (PRE-DAWN)</u>	<u>PER HOUR</u>	<u>WHERE TO LOOK</u>
TAURIDS, NORTH	10/20 – 11/10	11/12	5	East. Taurids consist of two streams – "South" is debris from Asteroid 2004 TG10 , "North" is from Comet 2P Enke .
LEONIDS	11/15 – 11/25	11/17	15+	Low in the NE. Every 33 years, this shower produces hundreds of meteors per hour – next big one is in 2034. November also has four minor showers (less than 5/hour) and one "variable".

LOOK FOR: >>>> The **ANDROMEDA GALAXY** (NGC 224). It is a collection of 300 billion stars 2 million light years from Earth directly overhead. It is barely visible to the unaided eye as a faint smudge of light but with binoculars or better yet, a telescope, you can see a huge edge-on oval that is more than double the size of our own Milky Way Galaxy. Its faint spiral arms extend more than six times the apparent diameter of the Moon.

THE SDSS

The Sloan Digital Sky Survey already has produced the most detailed map of the universe ever created, with images of nearly 500 million stars and galaxies available to the public. The map shows the structure of the universe at the grandest scales, with long walls of galaxies snaking around near-empty voids and has mapped nearby stars in the Milky Way. Astronomers using the SDSS can now figure out how far away a galaxy is by using data from *Type 1A Supernovae*,

METEORITES

Some meteorites appear with a fireball, a sonic boom, and havoc on the ground and countless others plummet to Earth unseen where a few may be picked up by meteorite hunters.

Scientists explain how they are bettering the odds of catching falling space rocks in the act by expanding automated camera networks that monitor meteorites' initial fiery descent. Weather radar also directs searchers to patches as small as a square kilometer.

CORONA ERUPTIONS

A team of astronomers, using NASA's three Sun-gazing spacecraft spotted unusual Solar eruptions in which a series of fast "puffs" forced the slow ejection of a massive burst of plasma from the outermost atmosphere of the Sun (the *corona*) over a period of three days.

The corona, is made of plasma that has a temperature of millions of degrees and extends millions of kilometers into space. The "puffs" occurred at the base of the corona and rapidly exploded outwards into interplanetary space.

After about 12 hours, a much larger eruption of material began, apparently eased out by the smaller-scale explosions.

WHITE DWARF NEW STARS

Scientists at the University of Western Australia examined more than 22,000 galaxies and found that while dwarf galaxies are efficient at creating stars from gas. Giant galaxies are much less efficient at star formation and expand by snacking on their neighbors.

They said: "All galaxies start off small and grow by collecting gas and efficiently turning it into stars. Then every now and then they get completely "eaten" by some much larger galaxy. Our Milky Way Galaxy hasn't merged with another large galaxy for a long time but you can still see remnants of all the old galaxies we've cannibalized."

PLANET WATER

Astronomers have found water vapor in the atmosphere of a planet about four times as large as Earth. It is the smallest planet for which scientists have been able to identify some chemical components of its atmosphere.

The finding of water vapor and hydrogen in the atmosphere of the exoplanet *HAT P-11b* in *Cygnus* is not only an astonishing piece of long-distance detective work but it also suggests that astronomers' ideas about how the planets formed appear to hold true for other planetary systems, as they do in ours.

NEW MARS VISITOR

An Indian spacecraft entered Mars space on September 24 after a 300-day voyage through interplanetary space.

OLDE GALAXYS?

1/ Astronomers usually have to look very far into the distance to see back in time when the Universe was young. A ragged collection of stars and gas clouds in galaxy **DDO 68** (UGC 5340) looks like a recently-formed galaxy. But, is it really as young as it looks?

Elderly galaxies tend to be larger thanks to collisions and mergers with other galaxies and are populated with a variety of different types of stars - old, young, large, and small ones. **DDO 68** is the best representation yet of a primordial galaxy in the local Universe that is an older galaxy enriched with heavier elements forged in stellar furnaces over multiple generations of stars.

2/ The *Hubble Space Telescope* has spotted a tiny, faint galaxy that is one of the "farthest-away" galaxies ever seen and is estimated to be more than 13 billion light-years away from Earth. Scientists say "This galaxy is an example of what is suspected to be an abundant, underlying population of extremely small, faint objects that existed about 500 million years after the big bang, the beginning of the universe."

COMET SPLIT

Comet **C/2011J2** (LINEAR) is now in the constellation **Andromeda** and appears to have split into two pieces.

NEW HORIZONS

After seven-plus years of hibernating through most of the 2.5-billion mile journey from Jupiter to Pluto and the inner reaches of the Kuiper Belt, *New Horizons* was put into hibernation on 8/29 for 99 days that ends 12/6. Encounter preparations will begin, and six weeks later, the Pluto encounter itself will start.

"Please tell your friends and your neighbors, and your family about New Horizons and the coming exploration of the Pluto system next year! Nothing quite like it has happened in decades, and we want everyone to know because the mission team is planning a wide variety of ways to bring everyone along on a very special space adventure with us."

ROSETTA AND PHILAE

Following its 10-year journey through the Solar System, *Rosetta's* lander *Philae* will be released on November 12th. The landing site is located on the smaller of the comet's two "lobes".

The *Rosetta* mission has been conducting an unprecedented scientific analysis of the comet, a remnant of the Solar System's 4.6 billion-year history.

By studying the gas, dust and structure of the nucleus and organic materials associated with the comet, the *Rosetta* mission should become the key to unlocking the history and evolution of our Solar System, as well as answering questions regarding the origin of Earth's water and perhaps even life.

See: http://www.esa.int/Our_Activities/Space_Science/Rosetta

CHINESE BALLOON PLAN

A private company in Beijing is planning to build a high-altitude balloon to take people 25 miles to the brink of Earth's atmosphere.

Spacevision, would transport passengers in a pressurized capsule to extreme heights for a brief moment of reduced gravity and then descend by parachute.

POWERFUL MICROQUASAR

A new image from the Hubble Space Telescope shows **NGC 7793**, a spiral galaxy in the constellation of **Sculptor**, and one of the closest groups of galaxies to the **Local Group** — the group of galaxies containing the Milky Way and the Magellanic Clouds.

Although it may look serene and beautiful the galaxy is actually a very dramatic and violent place. Astronomers have discovered a powerful **microquasar** within **NGC 7793** — a system containing a black hole feeding on material from a companion star.

While many full-sized quasars are known at the cores of other galaxies, it is unusual to find a quasar in a galaxy's disc rather than at its center. See:

<http://www.spacetelescope.org/images/potw1438a/>
WATER ON AN EXOPLANET

Astronomers have discovered clear skies and steamy water vapor on an exoplanet (known as **HAT-P-11b**). It is about the size of Neptune, making it the smallest ever found on which water vapor has been detected.

The molecular makeup of these lower regions can reveal important information about the composition and history of a planet. Finding clear skies on a Neptune-size planet is a good sign that some smaller planets might also have similarly good visibility.

EARLIEST STARS

Certain primordial stars have had an unusual death. These objects would have exploded as supernovae and burned completely, leaving no black hole behind.

First-generation stars are especially interesting because they produced the first heavy elements, or chemical elements other than hydrogen and helium. In death, they sent their chemical creations into outer space, paving the way for subsequent generations of stars, solar systems and galaxies.

FUTURE OF EARTH

Earth is fragile. Our environment is delicately balanced. Small changes in temperature, chemical makeup of the atmosphere and variations in the geomagnetic field could change life as we know it.

Famed British cosmologist Stephen Hawking presented a lecture on the survival of the human race and said there is only one way for humanity to survive the next thousand years. We must get off the planet and colonize space.

"HOT JUPITERS"

In a "first time", a team of international astronomers has discovered two Jupiter-sized extra-solar planets, each orbiting one star of a binary-star system.

Most known extra-solar planets orbit stars that are alone yet many stars are part of binary systems, twin stars formed from the same gas cloud. But now, two stars of a binary system are both found to host a "hot Jupiter" exoplanet.

LOTS OF SPOTS

Over the past month the Sun has produced quite a few sunspot groups, with some of them quite large. Most solar storms are produced in and above sunspots. Since we are near the period of **solar maximum**, this frequency of sunspot production is not surprising. See: <http://www.youtube.com/watch?v=AVmZ09Eqveg>

TITAN

Data from the *Cassini* mission reveals that a giant polar vortex hovering over the Titan's South Pole contains frozen particles of hydrogen cyanide. Titan is the only moon in the solar system that is cloaked in a dense atmosphere.

Like our home planet, Earth, Titan experiences seasons. As it makes its 29-year orbit around the Sun with Saturn, a season lasts about seven Earth years.

THE MOON'S "OCEAN OF STORMS"

Oceanus Procellarum, a vast dark patch on the western edge of the Moon's near side, has long been a source of mystery for planetary scientists. Some have suggested that the "ocean of storms" is part of a giant basin formed by an asteroid impact early in the Moon's history. But new research found a series of linear features forming a giant rectangle, nearly 1,600 miles across, running beneath the Procellarum region, and appearing to be the remnants of ancient rifts in the Moon's crust.

See: <http://www.sci-news.com/space/science-mystery\moons-oceanus-procellarum-02185.html>

TELESCOPE DELAY

Plans to build the world's largest telescope atop the summit of Hawaii's Mauna Kea were delayed when a groundbreaking ceremony was thwarted by native Hawaiian protesters --- Mauna Kea and the surrounding peaks are sacred.

Hawaiian activists have been fighting the Thirty Meter Telescope in court for the last four years, but have been unsuccessful in stalling plans. Opponents of the \$1.4 billion multinational project say the construction will desecrate a place many native Hawaiians use for burials, the interment of umbilical cords (called "piko"), as well as traditional celestial observation ceremonies.

DETECTING MARS WATER

A Washington State University undergraduate has helped develop a new method for detecting water on Mars.

Kellie Wall, 21, of Port Orchard, Wash., looked for evidence that water influenced crystal formation in basalt, the dark volcanic rock that covers most of eastern Washington and Oregon. She then compared this with volcanic rock observations made by the rover *Curiosity* on Mars' Gale Crater.

EXTREME "WASP 43b"

A team of scientists made the most detailed global map yet of the glow from a turbulent planet outside our solar system, revealing its secrets of air temperatures and water vapor.

Hubble observations show the exoplanet, (WASP-43b) is a world of extremes, where seething winds howl at the speed of sound from a 3,000-degree-Fahrenheit "day" side, to a pitch-black "night" side with temperatures below 1,000 degrees Fahrenheit. The planet is about the same size as Jupiter, but is nearly twice as dense and it completes an orbit in just 19 hours.

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