

THE YOUNG ASTRONOMERS NEWSLETTER

Volume 23 Number 1

STUDY + LEARN = POWER

December 2014

The December Solstice (first day of Winter) occurs at 6:03 PM on 12/20

ROSETTA AND PHILAE

One of the biggest gambles in space history came to a climax on the November 12th when Europe made the first-ever landing on a comet - **67P/Churyumov-Gerasimenko**. The 220-pound **Philae** space probe detached from "mothership" **Rosetta** and headed for a deep-space minuscule landing site on the treacherous surface of an object darker than coal that is **300 million miles from home**. It will carry out experiments as they hurtle toward the Sun.

And an instrument aboard **Rosetta** has already detected some intriguing chemical odors from the comet. Molecules include ammonia, methane, hydrogen sulphide, hydrogen cyanide and formaldehyde (like rotten eggs, horse stable, alcohol and bitter almonds).

Just over 5,000 comets have been observed since the first recorded sighting by Chinese skygazers around 240 BC. Some experts believe there could be as many as a trillion out there, the European Space Agency says.

FAST GAMMA RAY FLARES

The **MAGIC** telescopes at La Palma have recorded the fastest gamma-ray flares seen to date that were produced in the vicinity of a super-massive black hole. Scientists explain this is like lightning in a storm. The scientists were astonished by the brevity of the flares, lasting only for a few minutes.

MAGIC is two 17 meter diameter reflective telescopes built and operated by an international collaboration of 160 European scientists.

THE GREAT RED SPOT

The ruddy color of Jupiter's Great Red Spot is likely a product of simple chemicals being broken apart by sunlight in the planet's upper atmosphere, according to a new analysis of data from NASA's *Cassini* mission. The results contradict the other leading theory for the origin of the spot's striking color - that the reddish chemicals come from beneath Jupiter's clouds.

URANUS

The normally bland face of Uranus has become increasingly stormy, with enormous cloud systems so bright that for the first time, amateur astronomers are able to see details in the planet's hazy blue-green atmosphere.

AZTEC-3

Peering deep into time with one of the world's newest, most sophisticated telescopes, astronomers have found a galaxy - **AzTEC-3** - that gives birth annually to 500 times the number of suns as the Milky Way galaxy. A team of researchers used ALMA to gaze back over 12.5 billion years to find bustling galaxies creating stars at a breakneck rate. The astronomers believe that **AzTEC-3** and the other nearby galaxies appear to be part of the same system, but are not yet gravitationally bound into a clearly defined cluster. This is why the astronomers refer to them collectively as a **protocluster**.

ROCKETRY CHALLENGE

NASA has selected eight teams from middle and high schools across the country to participate in the 2014-2015 NASA Student Launch Challenge, next April 7-12.

The Challenge engages students in a research-based, experiential exploration activity. Teams design, build and launch a reusable rocket, with a scientific or engineering payload, and able of reaching an altitude of one mile.

Of the eight selected teams, Durham Area Rocketry, Durham, North Carolina and Victory Christian Center School, Charlotte, North Carolina were chosen. See: <http://go.nasa.gov/1uNpJfq> (NC pride is OK!)

ACTIVE ASTEROIDS

A two-person Carnegie team using the Gemini Observatory has discovered a new active asteroid called **62412** in the main asteroid belt between Mars and Jupiter. **Active asteroids** are a newly recognized phenomenon. **62412** is only the 13th known **active asteroid** in the main asteroid belt where it is estimated that there are likely about 100 based on the discovery.

Active asteroids sometimes have the appearance of comets, when dust or gas is ejected from their surfaces to create a sporadic tail effect. See:

<http://www.spxdaily.com/images-1g/faint-tail-active-asteroid-62412-1g.jpg>

VOLUNTEER COMET OBSERVATION

When the double asteroid **Patroclus-Menoetius** passed directly in front of a star on the night of October 20, a team of volunteer astronomers across the U.S. was waiting. Observing the event (an occultation) from multiple sites, each observer recorded the precise time the star was obscured. This provided the first accurate determination of the two objects' size and shape.

HD 95086

Researchers, studying what appears to be a beefed-up version of our solar system, discovered that it is encased in a halo of fine dust. The dusty star system, called **HD 95086** is located in the constellation **Carina** and is thought to include two belts of dust, which lie within the newfound outer dust halo.

One of these belts is warm and closer to its star, as is the case with our solar system's asteroid belt, while the second belt is cooler and farther out, similar to our own Kuiper belt of icy comets.

COSMIC CRASH

ESO's Very Large Telescope has provided researchers with the best view yet of a spectacular cosmic crash, and revealing for the first time, the motion of gas ripped out of galaxy **ESO 137-001** as it ploughs at high speed into the vast **Norma** galaxy cluster. The galaxy is being stripped of most of its gas - the fuel needed to make the next generations of young blue stars. Scientists propose that the observed process will help to solve a long-standing scientific riddle.

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> ***

Puzzles

Find The Word

E I G H T M R O T S	APART	ODORS
C D E E P S C R E E	APPEAR	PHILAE
A L A I B I A T P I	BLAND	PWOOD
P M A L M P I I H R	COSMIC	SITES
S W A S A S R T I E	EERIE	SPACE
I N O H R P H A L E	EIGHT	SPEED
D C O O L E P N A H	FAINT	SPENT
I R D R D N H E E P	GAMMA	STORM
N O A S M T N I A F	HORSE	TEAMS
G P E E G A M M A R	NORMA	TITAN

Scrambled Astronomy

MORE THINGS IN SPACE

SHELO _ _ _ _ _

LDSOBIE _ _ _ _ _

TSMEREO _ _ _ _ _

EUALNB _ _ _ _ _

DAFSRW _ _ _ _ _

(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** *****

“The Oyster’s” pearl - <http://www.spacetelescope.org/images/potw1444a/>
 Titan and Rhea - http://deskarati.com/wp-content/uploads/2014/11/r1351767_18940883.jpg
 Jupiter’s one-eyed giant Cyclops - http://www.nasa.gov/sites/default/files/s1431aw_0.jpg

SITE OF THE MONTH

Solar image sites - http://www.swpc.noaa.gov/solar_sites.html

***** **MOON IN DECEMBER** *****

Full Moon: 12/6 **Last Quarter:** 12/14 **New Moon:** 12/22 **First Quarter:** 12/28
Apogee: 12/12 6:04 PM 251,396 mi. (404583 km) **Perigee:** 12/24 11:04 AM 226,670 mi. (364790 km)
 ** December’s Full Moon was called the Cold Moon and Long Night Moon.
 ** **Best observing nights:** 12/13 – 12/27

***** **PLANETS IN DECEMBER** *****

VENUS – appears low in the SW about 30 minutes after sunset on the 10th and higher each evening.
MERCURY - returns on the 29th and is just below Venus after sunset. **SATURN** – is in the ESE one hour before sunrise on the 15th and three hours before sunrise by month’s end. **JUPITER** is high in the E before midnight and high overhead by dawn as it moves towards the W. **MARS** - low is low in the SW at dusk and sets about 3 1/2 hours after sunset. **URANUS** – is very faint, low in the SSW in early December.

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

<u>NAME</u>	<u>DATES</u>	<u>BEST (PRE-DAWN)</u>	<u>PER HOUR</u>	<u>WHERE TO LOOK</u>
GEMINIDS	12/7 – 12/17	12/14	120!	East, in the GEMINI constellation.
The multi-colored Geminids are considered to be the best shower of the year – well worth seeing in the pre-dawn hours. This shower is the result of debris left by Comet Phaeton as it passed by in 1982.				
URSIDS	12/17 – 12/25	12/23	5 - 10	North, in Ursa Minor, the Little Dipper. Ursids are debris from Comet Tuttle, discovered in 1790.
** December has five minor showers (less than 5/hour) and one “variable”.				

LOOK FOR: >>>> With a telescope, watch the **FOUR LARGEST MOONS** of Jupiter and their ever-changing patterns. >>>> The **SUN** will be at its most southerly point of the year on the 20th at 6:03 PM. >>>> The **Moon** passing only 1/2° north of **Uranus** on the 1st. >>>> The **Andromeda Galaxy – M31**. Go northeast from the northeast corner of Great Square and look for a faint blur – this is M31. It is the most distant object visible with the naked eye.

CHINA'S SPACE PLANS

1] China succeeded in the world's first mission to the Moon and back for some 40 years, becoming the third nation to do so after the former Soviet Union and the United States. China plans to launch a *space station* and cargo spacecrafts around 2016, followed by the *Shenzhou-11* spacecraft and *Tianzhou* cargo craft to rendezvous with the lab. A core module will be launched around 2018 and the station completed around 2022.

2] After successfully putting the "**Jade Rabbit**" lunar rover on the Moon, Chinese space experts say the country's planned Mars vehicle will be larger, tougher and a better climber. A real-sized model of the rover was on display at the **Airshow China 2014**. A lead scientist in China said plans are to land a rover around 2020, collect samples and bring them back around 2030. Also, the Mars "buggy" will be solar-powered.

CHARA SPOTS A FIREBALL

The fireball of a nova's thermo-nuclear explosion from a white dwarf star has now been captured by astronomers in remarkable detail -- the first time such a cosmic event has been recorded in action.

The explosion was in *Nova Delphinus* in the constellation of **Delphinus**. Scientists used the **CHARA Array**, which amasses the light from six optical telescopes to capture super-high resolution imagery.

NGC 4526

Galaxy **NGC 4526** has dark lanes of dust and a bright diffuse glow like a halo. It is one of the brightest **lenticular** (lens-shaped) galaxies known, a category between spirals and ellipticals. It has hosted two supernova explosions and has a huge, central super-massive black hole with the mass of 450 million Suns. See: <http://www.nasa.gov/content/goddard/hubble-views-the-whirling-disk-of-ngc-4526/#.VHKG-SLF-NA>

A SEA OF STARS

A Caltech astronomy team detected a diffuse cosmic glow that appears to represent more light than that produced by known galaxies in the universe. They say that the best explanation is that the light originates from stars that were stripped away from their parent galaxies and flung out into space as those galaxies collided and merged with other galaxies. The discovery suggests that many previously undetected stars permeate what had been thought to be dark spaces between galaxies, forming an interconnected sea of stars.

TITAN'S NORTH POLE

Cassini had imaged the lofty cloud that was part of the winter cap of condensation in the stratosphere over Titan's north pole. It contains methane ice, which produces a much denser cloud than the ethane ice previously identified there. The clouds form through a cycle of evaporation and condensation, with vapor rising from the surface, encountering cooler and cooler temperatures and falling back as precipitation.

PLANET WITH AN ODD ORBIT

Astronomers have found a planet with a punctuality problem. **PH3c** has a hydrogen and helium atmosphere and nearly avoided detection because it has a highly inconsistent orbit time due to the gravitational influence of other planets in its system. **PH3c's** orbital period changed by 10.5 hours in just 10 orbits.

ANCIENT MAYHEM

Hubble has picked up the faint, ghostly glow of stars ejected from ancient galaxies that were gravitationally ripped apart several billion years ago. The mayhem happened 4 billion light-years away, inside an immense collection of nearly 500 galaxies nicknamed "**Pandora's Cluster**," and also known as **Abell 2744**. See: <http://www.spxdaily.com/images-lg/massive-galaxy-cluster-abell-2744-pandora-cluster-lg.jpg>

BRIGHTEST PULSAR

A team of astronomers discovered a pulsating star shining with the energy of 10 million Suns. It is the brightest pulsar ever seen. They are optimistic that more ultra-bright pulsars will be found.

Astronomers previously thought that this type of "**ultraluminous X-ray source**" was likely to be made up of black holes five to 50 times more massive than our Sun but that understanding is now in question.

GG TAU-A

It was recently discovered that one of **GG Tau-A's** components is itself a double star - this object is in the constellation **Taurus**. Like a wheel in a wheel, **GG Tau-A** contains a large, outer disk encircling the entire system as well as an inner disk around the main central star. Its presence has been an intriguing mystery for astronomers

A French team found gas clumps in the region between the two disks indicating that material is moving between the disks, with one feeding off the other.

JUPITER'S EYE

This trick that a planet is looking back at you is actually a *Hubble* treat in an eerie, close-up view of Jupiter. *Hubble* saw the shadow of the moon Ganymede sweep across the center of the Jupiter's "Storm". It has the uncanny appearance of a pupil in the center of a 10,000 mile-diameter "eye". For a moment, Jupiter stared back- at *Hubble* like a one-eyed giant Cyclops.

See: http://www.nasa.gov/sites/default/files/s1431aw_0.jpg

NGC 1291

NGC 1291 might look like a spoked wheel but it is a ringed galaxy that is actually a vast place of stellar life. A new *Spitzer* image shows the unusual ring where newborn stars are just now starting to light up.

It is a **barred galaxy** because its central region is dominated by a long bar of stars that looks like the letter "S". See: <http://www.spxdaily.com/images-lg/spitzer-infrared-galaxy-ngc-1291-lg.jpg>

CRATERS IN SWEDEN

Some 458 million years ago, Earth was hit with two rocks from a double asteroid strike that slammed into the shallow seas that covered modern-day Scandinavia. With the later uplift of Earth's crust, two craters were created. A team of astronomers drilled into the craters and mapped the **halo of ejecta** -- a ring of debris hurled out by the smash miles away from the inner crater.

EARLY MOUNTAIN RANGE

Scientists have found evidence that a huge mountain range sustained an explosion of life on Earth 600 million years ago. It spanned at least 1550 miles of modern western Africa and northeast Brazil. The range was formed by two continents colliding and the mountains have long since washed away.

HUGE SUNSPOT

On October 18th, a sunspot rotated over the left side of the Sun and grew to be the largest active region seen in the current solar cycle. It was almost 80,000 miles across. The largest sunspot on record occurred in 1947; it grew to be almost three times as large as this one.

Sunspots point to relatively cooler areas on the Sun with intense and complex magnetic fields poking out through the Sun's surface. Such areas can be the source of solar eruptions such as flares or coronal mass ejections.

ABSENCE OF STAR BIRTH

Galaxy clusters contain hundreds or thousands of galaxies immersed in gas, and with temperatures in the millions of degrees. Over time, the gas in the centers of the clusters should cool enough that stars form at prodigious rates. The latest research found that the interaction of cavities with the gas may be generating turbulence, or chaotic motion, which then disperses to keep the gas hot for billions of years, slowing the growth of new stars. See: <http://chandra.si.edu>

BLACK HOLE INCIDENT

Astronomers had the closest look yet at what happens when a black hole takes a bite out of a star - and the star lives to tell the tale. A super-massive black hole tore off a chunk of material from a star in **Ursa Major** and astronomers couldn't see the star itself but did see the light that flared as the black hole "ate" the material that it captured. See:

https://www.youtube.com/watch?v=ahDuOt_eKgg

MARTIAN METEOR SHOWER

NASA and European spacecraft have detected evidence of a "spectacular" meteor shower on Mars caused by the close approach of **Comet Siding Spring** last month. If a human had been standing on the Red Planet at the time, they might have seen thousands of meteors per hour followed by a widespread yellow afterglow that lasted for days.

HL TAU SUPRISE

A new *Atacama* image revealed the planet-forming disk surrounding **HL Tau**, a Sun-like star in the constellation **Taurus**. "Never-before-seen" features include multiple concentric rings separated by gaps, and suggesting that planet formation is already well underway. Astronomers said: "This is surprising since **HL Tau** is no more than a million years old and such young stars are not expected to have large planetary bodies capable of producing the structures in this image," See:

<http://deskarati.com/wp-content/uploads/2014/11/zur2wuialwjwyb8cgssb.jpg>

WHAT MAKES A DEAD STAR EXPLODE?

Scientists have long suspected a mechanism for making a white dwarf go supernova but were not able to confirm it. ESA's *INTEGRAL* observatory imaged an exploding supernova in the **M82** galaxy as it threw off gamma rays in its final death throes.

A belt of gas from a companion star built up around the equator of the white dwarf detonated, and triggered the internal explosion of the white dwarf that became the supernova. Material from the explosion expanded, becoming transparent to gamma rays. See the sequence at: <http://io9.com/now-we-know-what-makes-white-dwarf-stars-go-supernova-1627538128>

SKA IN AFRICA

Nine African countries have agreed on setting up one of the world's largest radio telescope arrays that will revolutionize space science in the continent. Government officials meeting in Nairobi said the countries have finalized the harmonization of policies and laws to facilitate the installation of the radio telescope named **Square Kilometer Array (SKA)**

WHAT IS G2 ?

Astronomers have been puzzled by a bizarre object known as **G2** in the center of the Milky Way. It was believed to be a hydrogen gas cloud headed toward our galaxy's enormous black hole. They now believe that **G2** is most likely a pair of binary stars that had been orbiting the black hole in tandem and merged together into an extremely large star, cloaked in gas and dust

HEMATITE ON MARS

Reddish rock powder from the first hole drilled into a Martian mountain by the *Curiosity* rover has yielded confirmation of much more hematite than any rock or soil sample previously analyzed. Hematite is an iron-oxide mineral that gives clues about ancient environmental conditions from when it was formed.

METEORS

Japanese astronomers spotted a large fireball as it flashed a green streak above the horizon and classed it as a "bolide" - a meteor that burns bright enough to be witnessed across a wide area, and which usually features a bright terminal flash as it disappears from the night sky. Another meteor lit up the skies above the Midwest and East Coast in the United States and a piece of burning space junk was seen in and around Chicago.

XZ TAURI

Hubble has snapped a striking view of a multiple star system called **XZ Tauri**, its neighbor **HL Tauri**, and several nearby young stellar objects. **XZ Tauri** is blowing a hot bubble of gas into the surrounding space, which is filled with bright and beautiful clumps that are emitting strong winds and jets. See:

[http://www.astronomy.com/news/2014/11/](http://www.astronomy.com/news/2014/11/jets-bubbles-and-bursts-of-light-in-aurus)

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GAIA

Researchers from Princeton University and Lund University in Sweden calculated that the observational satellite *Gaia* will capture the motion, physical characteristics and distance from Earth of roughly 1 billion objects, mostly stars as many as 21,000 exoplanets, in the Milky Way galaxy with unprecedented precision during its five-year mission.

ASTEROID BENNU

NASA's asteroid-sample-return mission *OSIRIS-REX* will be launched toward asteroid **Bennu** in late 2016, arrive in 2018, and return a sample of Bennu's surface to Earth in 2023. **Bennu's** experiences will tell us more about where our solar system came from and how it evolved. See: <http://svs.gsfc.nasa.gov/cgi-bin/details.cgi?aid=20218>

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