

THE YOUNG ASTRONOMERS NEWSLETTER

Volume 23 Number 2

STUDY + LEARN = POWER

January 2015

ROSETTA

ESA's orbiting *Rosetta* spacecraft is expected to come within four miles of the surface of comet 67P/Churyumov-Gerasimenko in February 2015. The flyby will be the closest the comet explorer will come during its prime mission.

EXOPLANET SEEN FROM EARTH

For the first time, a ground-based telescope has observed a super-Earth alien planet passing in front of its host star. The exoplanet, roughly twice the size of Earth, is **55 Cancri e**. Its host star is **55 Cancri**, a Sun-like star 40 light-years away that can be spied with the naked eye in the **Cancer** constellation.

A LIGHT SHOW

Two galaxies, **NGC 2207** and **IC 2163** in the constellation of **Canis Major** met in a grazing encounter and created a spectacular light show. They have hosted three supernova explosions in the past 15 years and have produced one of the most bountiful collections of super-bright X-ray lights known. See:

<http://www.spxdaily.com/images-lg/galaxy-merging-ngc2207-ic2163-spitzer-desk-lg.jpg>

GROWTH OF NEW BINARY STARS

Astronomers in Taiwan found spiral arms of molecular gas and dust around "baby twin" stars, **binary protostars**. Gas motions to supply materials to the twin were also identified. These observational results unveil, for the first time, the mechanism of the birth and growth of binary stars, which are typical throughout the universe

LONSDALEITE

A group of Arizona State University scientists now show that what has been called **lonsdaleite** associated with impacts by meteorites and asteroids is a structurally disordered form of ordinary diamond.

RED DWARF STARS

Red dwarf stars (M dwarfs) are being hailed as the best places to discover alien life. They are by far the most common stars in our galaxy, making up 75 percent of all stars. They are also the longest-lived -- they can burn for trillions of years, far longer than the ten-billion-years lifespan of our Sun. And, nearly all of them may have a planet in the habitable zone.

METEORITE FINDING

A team of scientists have the results of an investigative survey into the **Sutter's Mill meteorite** that landed in California in 2012. The results reveal that the meteorite contained a number of features associated with minerals as well as organics.

A key conclusion and one that is likely to be of keen interest to astrobiologists, is confirmation that meteorites can become contaminated by Earth-based organics.

GIOIELLO

A distant, massive galaxy cluster, **XDCP J0044.0-2033**, is nicknamed "**Gioiello**", which is Italian for "jewel". A research team chose this name because an image of the cluster contains many sparkling colors from the hot, X-ray emitting gas and various star-forming galaxies within the cluster.

They gathered enough X-ray data from *Chandra* to determine that the **Gioiello Cluster** has a whopping 400 trillion times the mass of the Sun. Click on:

<http://chandra.harvard.edu/photo/2014/xdcp004/>
GALAXY EJECTS HUGE CLOUDS OF GAS

Dense, cold clouds of gas, some weighing more than a billion Suns, were ejected out of a compact galaxy (**SDSS J0905+57**). It was at a speed of two million miles an hour, and they traveled tens of thousands of light-years into space.

BIG EYE

A composite image shows the central region of the spiral galaxy **NGC 4151**, dubbed the "Eye of Sauron" by astronomers for its similarity to the eye of the malevolent character in "The Lord of the Rings"

http://www.nasa.gov/mission_pages/chandra/multimedia/11-029.html#.VJnHVEsAc

KKs3

Dwarf spheroidal galaxy, KKs3, has been discovered in the vicinity of the constellation **Hydrus**. It's only the second known isolated **dwarf spheroidal galaxy** in the Local Group -- 54 galaxies that includes both the **Milky Way** and **Andromeda** galaxies.

INACTIVE DWARFS

Swarming around our home Galaxy is a menagerie of smaller dwarf galaxies, the smallest of which are the **dwarf spheroidals**. Within a well-defined boundary, dwarf galaxies are completely devoid of hydrogen gas; but beyond, the dwarf galaxies are teeming with star-forming material.

The Milky Way shuts down star formation in its smallest neighbors!

WATER

A new study is helping to answer a longstanding question: Did our planet make its own water through geologic processes, or did water come to us via icy comets from the far reaches of the solar system?

The answer is likely "both," according to researchers at The Ohio State University.

MESSIER 47

Messier 47 in the constellation of **Puppis** is one of the least densely populated open clusters with only around 50 stars visible compared to other similar objects with thousands of stars. See:

<http://news.nationalgeographic.com/news/2014/12/141223-starstruck-star-cluster-astronomy-science/>

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

S M A R B A C R O S	ABRAMS
F L Y B Y L E W E J	ALIEN
R R A E O T O S N W	BLOCKS
O R A S A S I C A H	CANIS
N S E W G R C O K O	CLOSE
T E I N D R S M N S	COMET
H H I N T T S E O E	DWARF
G R G L A E E T W J	ENTER
I R E I A C R O N I	FLYBY
L A S T S E L I M M	FRONT

JEWEL
KNOWN
LASTS
LIGHT
MILES
RINGS
RISES
SIGHT
WATER
WHOSE

**SCRAMBLED ASTRONOMY
IN THE OCEAN**

AGSTOEA	_____
OPLHNDI	_____
CABR	_____
HIFESS	_____
HALEW	_____

(Answers on page 4)

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)

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

“Wishing Well” Cluster - <http://scitechdaily.com/images/New-ESO-Image-of-Star-Cluster-NGC-3532.jpg>

Mosaic of Rosetta images: <http://blogs.esa.int/rosetta/2014/12/15/cometwatch-10-december/>

Latest ESA updates: <http://twitter.com/esascience>

SITE OF THE MONTH

Abrams Planetarium at MSU – <http://abramsplanetarium.org/>

***** **MOON IN JANUARY** *****

Full Moon: 1/4 **Last Quarter:** 1/13 **New Moon:** 1/20 **First Quarter:** 1/27

Apogee: 1/9 1:09 PM 251,924 mi. (405405 km) **Perigee:** 1/21 3:08 PM 223,496 mi. (359656 km)

** January’s Full Moon was called the Wolf Moon. ** **Best observing nights:** 1/13 -1/26

A **LUNAR MONTH** is 29.53 Earth days long.

***** **PLANETS IN JANUARY** *****

VENUS, MERCURY and **MARS** are low in the WSW to SW in evening twilight. At dusk on January 10th, Mercury is just over 0.6° to the lower right of Venus, - one of their closest approaches. **JUPITER** rises in the in the ENE about three hours after sunset on the 1st, and by 1/2 hour at month’s end. **JUPITER** and **SATURN** are in the WSW one hour before sunrise. **NEPTUNE** is just 0.2° north of **MARS** after nightfall on the 19th.

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

<u>NAME</u>	<u>DATES</u>	<u>BEST (PRE-DAWN)</u>	<u>PER HOUR</u>	<u>WHERE TO LOOK</u>
QUADRANTIDS	1/1 – 1/10	1/4	30	Northeast. The Quadrantids

shower can be as intense as the Perseids and Geminids but it only lasts for a few hours. The shower is believed to be created by debris from “The Great Comet of 1491” and may have passed closer to Earth than any other known comet. ** January has 3 minor, 4 radio-detected, plus 4 in the southern hemisphere.

YOU CAN USE YOUR FM RADIO TO DETECT METEORS as they enter the earth’s atmosphere. As the meteor burns up on entry, atmospheric gases are ionized creating conditions reflecting line of sight radio waves over the horizon from distant radio stations where they normally won’t travel.

See: [http://www.skyscan.ca/meteor_radio_detection.htm#Pick Stations](http://www.skyscan.ca/meteor_radio_detection.htm#Pick%20Stations)

LOOK FOR: >>>> Amazing details of the **MOON** on the afternoon of 1/26. Use a filter if available.

>>>> **SPECTACULAR CLOSE PAIRING** -- Start a six-month tracking of **VENUS** and **JUPITER to June 30th** when they will be less than 1/3 of a degree apart. >>>> **CASTOR** and **POLLUX** – the twins in Gemini. They were the first to sign up with Jason in the Golden Fleece legend.

MARS

MOROCCAN METEORITE

Scientists say that analysis of a meteorite that fell in the Moroccan desert three years ago revives theories about life on Mars. Close scrutiny of cracks in the rock revealed "unique" carbon traces. They added: "The carbon has a very probable biological origin and so far there is no other theory that we find more compelling". The meteorite, named **Tissint**, is one of a handful of rocks believed to have come from Mars, presumably after being knocked off its surface by an asteroid strike and wandering in space before landing on Earth.

MARS' HELLAS BASIN

Thanks to a break in the dusty 'weather' over the giant Hellas Basin, ESA's *Mars Express* was able to "see" the 7 km-deep basin and the frosty surface of Hellas Chaos. Hellas Basin is in the southern highlands of Mars and one of the Solar System's largest impact basins (2300 km diameter).

It is thought to have formed some 3.8-4.1 billion years ago during a heavy rain of asteroids and comets. Since its formation, Hellas has been sculpted by wind, ice, water and volcanic activity. It is also where most global dust storms on Mars originate.

See: <http://www.spxdaily.com/images-lg/mars-hellas-chaos-lg.jpg>

THE SEARCH FOR WATER

NASA plans to return astronauts to the Moon by 2020 for extended missions in search of more water and scientists say it might be a good idea to drop by Mars as well. In October 2009, NASA's *LCROSS*, found traces of water in the cold, permanently-shadowed crater at the south pole of the Moon.

The liquid discovered on the Moon's surface is suitable for drinking and is the result of the endless bombardment of comets.

METHANE ON MARS

NASA's *Mars Curiosity* rover has measured a tenfold spike in the organic chemical methane in the atmosphere around it and detected other organic molecules in a rock-powder sample collected by the robotic laboratory's drill.

Curiosity also detected different Martian organic chemicals in powder drilled from a rock dubbed Cumberland, the first definitive detection of organics in surface materials of Mars. These Martian organics could have formed on Mars or been delivered by meteorites.

MOUNT SHARP ON MARS

Observations by the *Curiosity Rover* indicate Mars' **Mount Sharp** was built by sediments deposited in the **Gale Crater** lake bed over tens of millions of years, and suggesting that ancient Mars maintained a climate that could have produced long-lasting lakes at many locations on Mars.

Mount Sharp is about 3 miles high, its lower flanks exposing hundreds of rock layers that show the repeated filling and evaporation of a Martian lake much larger and longer-lasting than any previously examined close-up.

ORGANIC MOLECULES ON MARS

The *Curiosity* rover has made the first conclusive detection of organic molecules on Mars. Organic molecules are the building blocks of all known forms of terrestrial life, and consist of a wide variety of molecules made primarily of carbon, hydrogen, and oxygen atoms. However, organic molecules can also be made by chemical reactions that don't involve life, and there is not enough evidence to tell if the matter found by the team came from ancient Martian life or from a non-biological process

METEORITE ALH84001

A new analysis of a Martian rock reveals a record of the planet's climate billions of years ago. Back then, water likely washed across its surface and any life that ever formed there might have emerged.

Designated **ALH84001**, it is the oldest meteorite we have from Mars, a chunk of solidified magma from a volcano that erupted four billion years ago. Since then something liquid, probably water, seeped through pores in the rock and deposited globules of carbonates and other minerals.

VERY FAINT NEO "RECOVERED"

European experts saw one of the faintest asteroids ever found - a chunk of space rock about 65 miles in diameter beyond the orbit of Mars. It had been seen before but then lost. This was one of the faintest recoveries of a NEO (near-earth object) ever achieved.

The observation was made possible by the unique performance of the telescope on Mt. Graham in Arizona.

It has twin 8.4 meter-diameter mirrors, a large field of view and is equivalent to a single 38.7-foot diameter instrument.

"KILLER ELECTRON" SHIELD

A University of Colorado Boulder team has discovered an invisible shield some 7,200 miles above Earth that blocks so-called "killer electrons," which whip around the planet at near-light speed and have been known to threaten astronauts, fry satellites and degrade space systems during intense solar storms!

The barrier to the particle motion was discovered in the Van Allen radiation belts, two doughnut-shaped rings filled with high-energy electrons and protons.

LOW MASS STARS

Planets orbiting close to **low-mass stars** (the most common stars in the universe) are prime targets in the search for extraterrestrial life. But new research indicates some such planets may not be hosting life because of intense heat during their formative years.

Low-mass stars, also called **M dwarfs**, are smaller than the Sun and much less luminous, so their habitable zone tends to be fairly close in.

The habitable zone is just right to allow liquid water but because of the great amounts of oxygen they build up, they're really a mirage; there's just no water there.

MAGELLANIC CLOUDS BRIDGE

Polish astronomers have discovered a young **stellar bridge** that forms a continuous connection between the **Magellanic Clouds**. The Clouds are comprised of two galaxies: the **Large (LMC)** and the **Small Magellanic Cloud** and are the pair of interacting galaxies closest to the Milky Way. The Clouds have always been of special interest to astronomers and they continue to play a significant role in our understanding of the Universe.

ERIS

Eris, the largest dwarf planet, was discovered in 2005 and initially described by NASA as the Solar System's tenth planet. **Eris** is 27% larger than **Pluto**, has a diameter of 2.3 kilometers and one satellite called **Dysnomia**.

Eris orbits the Sun at a distance of 96.4 astronomical units (92,955,730 miles) taking 557 years to complete one lap. (In 2006, **Pluto** and **Eris** have been classified as "dwarf planets" and subsequently added to the Minor Planet Catalogue.)

ORION

NASA marked a major milestone in its journey to Mars as the **Orion** spacecraft completed its first voyage to space, traveling farther than any spacecraft designed for astronauts has been in more than 40 years. The spacecraft was tested in space to allow engineers to collect critical data to evaluate its performance and improve its design.

The flight tested *Orion's* heat shield, avionics, parachutes, computers and key spacecraft separation events, exercising many of the systems critical to the safety of astronauts who will travel in *Orion*.

See: <http://www.nasa.gov/orion>

NEW ASTEROID

A Russian team has located a huge, mountain-sized asteroid whose orbit crosses the Earth's every three years. Experts say the giant object (2014 UR1160) poses no immediate threat of collision "but over a much longer period a collision looks quite likely".

The unexpected discovery underscores how little is still known about asteroids and their unpredictable orbits. A more serious issue, they say, is the estimated 100,000 near-Earth objects, such as asteroids and comets, which can cross our planet's orbit and are large enough to be dangerous.

Only about 11,000 have so far been tracked and cataloged.

MONSTER BLACK HOLE IN TINY GALAXY

Astronomers found a massive black hole hungrily feeding within a tiny dwarf galaxy. The galaxy, an irregular dwarf named **J1329+3234**, is one of the smallest galaxies yet to contain evidence of a massive black hole. Located over 200 million light-years away, the galaxy is similar in size to the Small Magellanic Cloud, one of our nearest neighboring galaxies, and contains a few hundred million stars.

The same team has now investigated the galaxy further, using ESA's *XMM-Newton* to hunt for this black hole in X-rays – and found something very surprising: the X-ray emission from **J1329+3234** is over 100 times stronger than expected for this galaxy.

A STRANGE GALAXY

Galaxy **J1649+2635** is a spiral galaxy like the Milky Way but with prominent "jets" of subatomic particles propelled outward from its core at nearly the speed of light. This is the first time that a galaxy was first identified as a spiral and then found to have large radio jets. The problem is that spiral galaxies are not supposed to have such large jets.

In order to figure out how these jets can be produced the astronomers looked for help in a large collection of images from both radio and optical telescopes, and the hands-on assistance of volunteer citizen scientists in an online project called the Galaxy Zoo. See:

<http://scitechdaily.com/images/Strange-Galaxy-Perplexes-Astronomers.jpg>

TURBULENCE AND NEW STARS

High-energy jets powered by supermassive black holes can blast away a galaxy's star-forming fuel, resulting in so-called "red and dead" galaxies: those brimming with ancient red stars but no hydrogen gas to create new ones. Now astronomers using ALMA have discovered that black holes don't have to be nearly so powerful to shut down star formation. By observing the dust and gas at the center of **NGC 1266**, the astronomers have detected a "perfect storm" of turbulence that is squelching star formation in a region that would otherwise be an ideal star factory.

A MISSION TO VENUS ?

The science world has been mostly concentrated on Mars and comets, but some scientists at NASA are starting to talk about Venus -- suggesting a manned mission to our closest neighbor could be simpler and less expensive than a trip to Mars.

Venus is actually closer to Earth than Mars, and experts say a manned mission there isn't unreasonable. Venus has a surface unimaginably hot -- 462 degrees Celsius, and, its lower atmosphere a highly pressurized oven of noxious gases.

A manned mission to Venus wouldn't have to involve the planet's surface. Researchers say just a few miles higher up and Venus's atmosphere boasts conditions not unlike Earth's, with more of a manageable temperature and pressure.

Astronauts could circle above Venus in a helium-inflated dirigible and conduct science experiments as they orbit.

BALLISTIC CAPTURE

Currently, the favored method for getting a spacecraft into orbit around Mars is the "**Hohmann transfer**." After rocketing through space at high speeds, it approaches Mars and its thrusters fire in the opposite direction, swinging the craft into orbit.

Scientists say **ballistic capture** would see the spacecraft launched out ahead of Mars' orbital path. It would gradually slow and hold in place, waiting for Mars to swing by -- the Martian gravity pulling the craft into orbit as it approached.

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