

THE YOUNG ASTRONOMERS NEWSLETTER

Volume 23 Number 11

STUDY + LEARN = POWER + SUCCESS

October 2015

ENORMOUS GALAXY CLUSTER

An international team of astronomers has discovered a gargantuan **galaxy cluster** with a core bursting with new stars — an incredibly rare find. The discovery is the first to show that gigantic galaxies at the centers of massive clusters can grow significantly by feeding off gas stolen from other galaxies.

Galaxy clusters are vast families of galaxies bound together by gravity. Our own galaxy, the Milky Way, resides within a small galaxy group known as the **Local Group**, which itself is a member of the massive Laniakea supercluster.

START OF A SOLAR SYSTEM

In a “first time” event, Great Britain astronomers have successfully peered through the dense cloud around a star that is still forming to observe the innermost region of a new solar system.

They described their surprising findings in their observations of the parent star, **HD 100546**, by saying: “We are beginning to understand the earliest life of planet-hosting stars on a scale that is comparable to our Solar System.” And: “Nobody has ever been able to probe this close to a star that is still forming and which also has at least one planet so close in.”

METEOR CRATERS IN SWEDEN

In another rare event, researchers in Sweden recently found evidence that two more meteors smacked into Earth at the same time, about 458 million years ago -- they uncovered the two craters just a few miles from each other. When the meteors landed, the area was just a seafloor, about 1,600 feet below the water's surface. One of the craters is huge, measuring 4.7 miles across. The other is about 2,300 feet across.

HOT JUPITERS YOUNG?

For years, astronomers have been stumped by a rare type of exoplanet -- “**Hot Jupiters**” -- gas giants which orbit unusually close to their stars. New evidence suggests **Hot Jupiters** migrate inward earlier in their life spans rather than later.. “This discovery suggests that hot Jupiters may be extremely young and potentially far more frequently found around stars in formation than around mature stars like the Sun,”

BREAKTHROUGH LISTEN PROJECT

In July, Russian billionaire philanthropist Yuri Milner announced that his **Breakthrough Prize Foundation** would donate \$100 million over the course of 10 years to fund the biggest SETI project ever attempted. The **Breakthrough Listen** project intends to direct some of the largest radio telescopes in the world on a decade-long mission to find evidence of intelligent life.

The Parkes radio telescope in Australia and the Robert C. Byrd Green Bank Telescope in West Virginia have been enlisted in the project to search the nearest million stars, which is times more stars than before, as well as listen along the galactic plane of the Milky Way and to a hundred nearby galaxies for radio signals from another world. <http://www.breakthroughinitiatives.org/>

SCULPTOR DWARF GALAXY

The **Sculptor Dwarf Galaxy** is one of the fourteen known satellite galaxies orbiting the Milky Way. These galactic hitchhikers are located close by in the Milky Way's extensive halo, a spherical region extending far beyond our galaxy's spiral arms.

A low level of heavy elements indicates that the average age of the stars in this galaxy is high. This quantity of old stars makes the Sculptor Dwarf Galaxy a prime target for studying the earliest periods of star formation in the universe.

CREATING IRON ORES

An isolated, iron-rich bay in the heart of East Africa is offering scientists a rare glimpse back into Earth's primitive marine environment, and supports theories that tiny microbes created some of the world's largest ore deposits billions of years ago.

Microbes in Kabuno Bay, Congo grow by a type of photosynthesis that oxidizes (rusts) iron rather than converting water into oxygen like plants and algae. See: <http://news.ubc.ca/2015/09/09/metal-eating-microbes/>

MOON'S SURFACE

Scientists believe that about 4 billion years ago, an army of asteroids pelted the Moon's surface, carving out craters and opening deep fissures in its crust. The impacts increased the Moon's porosity and opened up a network of large seams beneath the lunar surface.

Now scientists have identified regions on the far side of the Moon that may have been so heavily bombarded that the impacts completely shattered the upper crust, leaving these regions essentially as fractured and porous as they could be. See:

<http://news.mit.edu/2015/moon-crust-fractured-0910>

BRIGHT SPOTS ON CERES

The brightest spots on the dwarf planet **Ceres** gleam with mystery in new views delivered by the *Dawn* spacecraft. These closest-yet views of **Occator** crater give scientists a deeper perspective on these very unusual features.

Because these spots are so much brighter than the rest of **Ceres'** surface, the *Dawn* team combined two different images into a single composite view and produced animations that provide a virtual fly-around of the crater.

See: [http://www.jpl.nasa.gov/spaceimages/](http://www.jpl.nasa.gov/spaceimages/details.php?id=pia19890)

[details.php?id=pia19890](http://www.jpl.nasa.gov/spaceimages/details.php?id=pia19890)

and

[http://www.jpl.nasa.gov/spaceimages/](http://www.jpl.nasa.gov/spaceimages/details.php?id=pia19891)

[details.php?id=pia19891](http://www.jpl.nasa.gov/spaceimages/details.php?id=pia19891)

SUPERMASSIVE BLACK HOLES

There may be fewer pairs of supermassive black holes orbiting each other at the cores of giant galaxies than previously thought, according to a new study by astronomers who analyzed data from the Karl G. Jansky Very Large Array (VLA) radio telescope. Massive galaxies harbor black holes with millions of times more mass than our Sun at their centers.

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> ***

BRIGHT SPOTS ON CERES -- The brightest spots on the dwarf planet Ceres gleam with mystery in new views delivered by the Dawn spacecraft. See: <http://www.jpl.nasa.gov/spaceimages/details.php?id=pia19890> and <http://www.jpl.nasa.gov/spaceimages/details.php?id=pia19891>

PUZZLES

FIND THE WORD

A T E M O C L O U D	AFRICA	FLYBY
Y T S R I F H E E O	BLACK	FORTH
B A F R I C A N V Z	BURST	GLEAM
Y R B M A K S S E E	CLOUD	HOLES
L A R E O E C T M N	COMET	HOURS
F L T T S B S A M R	DENSE	LARGE
O O A E U R E A L N	DOZEN	METER
R S L R U L E J A B	EVENT	SOLAR
T O S O G T N E V E	FABRIC	STEAM
H T H E S E D E L B	FIRST	THESE

SCRAMBLED ASTRONOMY

METEOR SHOWERS

SIPICSD _ _ _ _ _

BIOSTOD _ _ _ _ _

DIYCSGN _ _ _ _ _

RILSDY _ _ _ _ _

DISURS _ _ _ _ _

(Answers below)

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The four-page **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** *****

Cat's Eye Nebula - http://www.esa.int/spaceimages/Images/2015/08/The_Cat_s_Eye_Nebula
 Mountains of Pluto - <http://i.imgur.com/uSZ0tMg.jpg?1>
 β Pic b orbiting β Pictoris: <http://spaceref.com/exoplanets/video-exoplanet-pic-b-orbiting-pictoris.html>

SITE OF THE MONTH

U S Naval Observatory - <http://www.usno.navy.mil/USNO>

***** **MOON IN OCTOBER** *****

Last Quarter: 10/4 New Moon: 10/13 First Quarter: 10/20 Full Moon: 10/27
Apogee: 10/11 9:15 AM 252,543 mi. (406,400 km) ** The October Full Moon was called
Perigee: 10/26 9:05 AM 222,759 mi. (358,472 km) the Harvest Moon and Hunter's Moon.
 ** Best nights for observing: 10/4 – 10/20

***** **PLANETS IN OCTOBER** *****

Spectacular pairings and gatherings all month before sunrise

JUPITER, VENUS, MARS and the bright star **REGULUS** are in a line within 17° in the eastern sky. **MERCURY** rises in the East below the three other planets on the 8th. **MERCURY** and **JUPITER** are the closest on the 17th at 0.4° apart. **VENUS** and **JUPITER** form their second 2015 close pairing on 10/25 and 10/26. **SATURN** is low in the SW evening sky.

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

<u>NAME</u>	<u>DATES</u>	<u>BEST NIGHT</u>	<u>PER HOUR</u>	<u>WHERE TO LOOK</u>
ORIONIDS	10/4 – 11/14	10/21	20	Low in the NW. After meteor showers were known to be produced by comets, astronomer A. S. Herschel first predicted the Orionids.
DRACONIDS	10/6 – 10/10	10/8 evening	5?	High in the northwest above Lyra in DRACO. Usually, this meteor shower offers no more than a handful of slow meteors per hour, even at its peak. The waning crescent moon this year is sure to provide a dark sky for the Draconids during the peak evening hours. Also, watch out if the Dragon awakes! This shower has been known to rain down hundreds or even thousands of meteors in an hour. ** October has eight minor showers - one in daylight.

LOOK FOR: >>>> **BIG DIPPER** – By the end of October only three stars in the handle will still be visible, but the nearby **LITTLE DIPPER** stays with us year round. >>>> In the southwest, bright **ANTARES** in Scorpius will be one by month's end. >>>> The showplace of the southern skies – the **LAGOON NEBULA**. It's looking like steam rising from the spout of the **Sagittarius Teapot**.

A RADIO PHOENIX

Astronomers have found evidence for a faded electron cloud "coming back to life," (much like the mythical **Phoenix**), after two galaxy clusters collided and high-energy electrons radiated primarily at radio frequencies – a "**radio phoenix**".

They think that the supermassive black hole close to the center of **Abell 1033** erupted in the past. Streams of high-energy electrons produced a cloud of bright radio emission that faded over a period of millions of years as the electrons lost energy and the cloud expanded. The "radio phoenix" emerged when another cluster of galaxies slammed into the original cluster, sending shock waves through the system causing the cloud to once again shine at radio frequencies.

See http://chandra.harvard.edu/photo/2015/a1033/WHITE_DWARF_PG1149+057

University of Warwick astronomers discovered that some dying stars suffer from "**irregular heartbeats**" in the rapid brightening events expected in otherwise normal pulsating white dwarfs. On the white dwarf **PG1149+057** in **VIRGO** they observed something completely unusual: every few days arrhythmic, massive outbursts, which broke the star's regular pulse and significantly heated up its surface for many hours.

LIFE IN OTHER UNIVERSES

Bizarre creatures that go years without water -- others that can survive the vacuum of open space. Some of the most unusual organisms found on Earth provide insights to help predict what life could be like elsewhere in the universe.

NASA's discovery of 500 new planets near the constellations Lyra and Cygnus touched off a storm of speculation about alien life. "If you don't explore the various options of what life may be like in the universe, you won't know what to look for when you go out to find it," said Schulze-Makuch, a professor in the WSU School of the Environment.

For a very interesting "read", see:

<http://www.scientificcomputing.com/news/2015/08/exploring-limits-life-universe>

ADDIS ABABA

High above the crowded streets of Addis Ababa, among fields where farmers lead oxen dragging wooden ploughs, sits Ethiopia's space program. Perched on the top of 10,500-foot high Mount Entoto, two metal domes house telescopes, each a meter in diameter. Operational for only a few months, the specialized equipment has propelled Ethiopia into an elite club of African countries to have embarked on a space program aimed to give it a technological boost to aid the country's already rapid development.

DAWN'S VISIT TO CERES

The closest-yet views of **Ceres** delivered by NASA's *Dawn* spacecraft, show the small world's features in unprecedented detail, including **Ceres'** tall, conical mountain; crater formation features and narrow, braided fractures. The spacecraft is mapping the surface of Ceres and collecting data that will give scientists a better understanding of the minerals found on Ceres' surface. Engineers and scientists will also be able to refine their measurements of Ceres' gravity field.

ZERO ROBOTICS

"**I wrote code for the International Space Station.**"

Imagine being able to add that to your resume, even before you graduate middle school! During the **Zero Robotics middle school finals** on August. 14th, more than 650 students in 11 states watched software they developed compete in the world's first robotics competition aboard the space station.

See: <https://www.whitehouse.gov/blog/2011/08/15/participate-robotics-competition-space>

TWIN JET NEBULA

M2-9 is a **planetary nebula**. The glowing and expanding shells of gas represents the final stages of life for an old star that has not only ejected its outer layers, but the exposed remnant core is now illuminating these layers resulting in a spectacular light show. But **M2-9**, the **Twin Jet Nebula** is not just any planetary nebula, it is a **bipolar nebula**.

Astronomers have found that the two stars each have about the same mass as the Sun. The larger star is approaching the end of its days and has already ejected its outer layers of gas. It's partner is a small white dwarf. See: http://sci.esa.int/science-e-media/img/content/images/2015/heic1518_600.jpg

COMET HITCHHIKER

Catching a ride from one solar system body to another isn't easy. You have to figure out how to land your spacecraft safely and then get it on its way to the next destination. The landing part is especially tricky for asteroids and comets which have low gravitational pull.

A JPL concept called **Comet Hitchhiker**, puts forth a new way to get into orbit and land on comets and asteroids, using the kinetic energy -- the energy of motion -- of these small bodies.

See: <http://www.nasa.gov/niac> and <http://www.nasa.gov/spacetech>

FLYBY PLANNED

2014 MU69 in the Kuiper Belt has been selected as the object of a planned *New Horizon's* flyby on New Year's Day 2019. After leaving Pluto next July, *New Horizons* will use about a third of its remaining propellant to adjust its course to fly past the object, about 28 miles across. That flyby, however, is contingent on the mission winning funding for an extended mission.

BINARY BLACK HOLE

A University of Oklahoma astrophysicist and his Chinese collaborator have found two supermassive black holes in **Markarian 231**, the nearest quasar to Earth. The discovery of two supermassive black holes is evidence of a **binary black hole** and suggests that supermassive black holes assemble their masses through violent mergers "The structure of our universe, such as those giant galaxies and clusters of galaxies, grows by merging smaller systems into larger ones, and binary black holes are natural consequences of these mergers of galaxies."

RUSSIA'S PLAN

More than four decades after humans last walked on the moon, Russia is sending a robotic spacecraft to the Moon to scope out potential locations for a planned lunar base. The high-tech base would feature living quarters for cosmonauts, laboratories, a launching and landing port for spacecraft, and even an astronomy observatory,

MINERALS

New research from a team led by Carnegie's Robert Hazen predicts that Earth has more than 1,500 undiscovered minerals and that the exact mineral diversity of our planet is unique and could not be duplicated anywhere in the cosmos. Minerals form from novel combinations of elements including volcanoes, plate tectonics, and water-rock interactions, and biological activity, such as chemical reactions with oxygen and organic material.

EARLY GALAXYS

By peering back in time using the *Hubble* and *Herschel* telescopes, an international astronomy team has shown for the first time that galaxies can change their structure over the course of their lifetimes. A large proportion of galaxies has undergone a major 'metamorphosis' since they were initially formed after the Big Bang.

The team observed about 10,000 galaxies and classified the galaxies into two main types: flat, rotating, disc-shaped galaxies, and, large, oval-shaped galaxies with a swarm of disordered stars. The results suggest a massive transformation in which disc-shaped became oval-shaped galaxies, possibly caused by many cosmic catastrophes in which two disk-dominated galaxies, were forced by gravity to merge into a single galaxy, destroying the disks and producing a pileup of stars.

THE PRAWN NEBULA

Deeply immersed in this huge stellar nursery are three clusters of hot young stars only a few million years old, that are glowing brightly in ultraviolet light. It is the light from these stars that causes the nebula's gas clouds to glow. **Gum 56**, also known as **IC 4628** or by its nickname, **the Prawn Nebula**, is filled with enough dust and gas to create an even newer generation of stars.

See: <http://www.eurekalert.org/multimedia/pub/98342.php>

INSIGHT MARS LANDER

Mars enthusiasts around the world can participate in NASA's journey to Mars by adding their names to a microchip headed to the Red Planet aboard NASA's *InSight Mars* lander, scheduled to launch next year.

The mission is the first dedicated to the investigation of the deep interior of the planet. It will place the first seismometer directly on the surface of Mars to measure Martian quakes and use seismic waves to learn about the planet's interior. See: <http://www.jpl.nasa.gov/news/news.php?feature=4691>

<http://www.jpl.nasa.gov/news/news.php?feature=4691>

MEASURING STAR DISTANCES

University of Cambridge astronomers have developed a new, highly accurate method of measuring the distances between stars. The best way to directly measure a star's distance is by **parallax** which is the apparent displacement of an object when viewed along two different lines of sight. If you hold out your hand in front of you and look at it with your left eye closed and then with your right eye closed, your hand will appear to move against the background.

The same effect can be used to measure the apparent motion of a nearby star compared to more distant background stars. The parallax method can only be applied for stars which are reasonably close to us.

OCEAN ON ENCELADUS

Saturn's moon Enceladus has a global ocean below its icy surface. Scientists studying data from NASA's Cassini spacecraft said that a very slight wobble the moon has as it orbits Saturn can only be explained if it has a layer of liquid water below its surface. Scientists had previously believed there was liquid water below the surface of some parts of Enceladus, but until now had no evidence that the layer was global, similar to the subsurface ocean within Jupiter's moon Europa.

SDO BLOCKED

On September 13th, the view of the *Solar Dynamics Observatory* on a constant watch of the Sun, was "photobombed" not once, but twice. Just as the Moon came into SDO's field of view Earth entered the picture, blocking SDO's view completely. When SDO's view of the Sun emerged from Earth's shadow, the Moon was just completing its journey across the Sun's face.

This is the first time ever that the two have coincided. <http://www.eurekalert.org/multimedia/pub/99251.php>

SOHO FINDS 3000 COMETS

On Sept. 13th the *Solar and Heliospheric Observatory*, a joint project of the European Space Agency and NASA, discovered its 3,000th comet, cementing its standing as the greatest comet finder of all time. Prior to *SOHO*'s 1995 launch, only a dozen or so comets had ever even been discovered from space while some 900 had been discovered from the ground.

OPEN SOURCE LAB EQUIPMENT

Open source lab equipment is the focus of a new study. Instead of spending millions of dollars every year replacing quickly obsolescent equipment, that money could be redirected to developing open source tools that are "upgradeable and transformable". The benefits could be huge: research would cost less, the equipment would improve each year, and educational tools would provide better inspiration and instruction.

SOLAR SYSTEMS EVOLVING

An accidental find of a collection of young red dwarf stars close to our solar system could give us a rare glimpse of slow-motion planet formation. Australian astronomers found large discs of dust around two of the stars, telltale signs of planets in the process of forming. They said: "We think the Earth and all the other planets formed from discs like these so it is fascinating to see a potential new solar system evolving."

BLACK HOLE DUO

Entangled by gravity and destined to merge, two candidate black holes in a distant galaxy appear to be locked in an intricate dance. Researchers have the most compelling confirmation yet for their existence and found new details about their odd, cyclical light signal. The duo, **PG 1302-102**, are the tightest orbiting pair detected so far, with a separation not much bigger than the diameter of our solar system. They are expected to collide and merge in less than a million years.

See: <http://www.nasa.gov/galex> and <http://www.galex.caltech.edu>

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