

THE YOUNG ASTRONOMERS NEWSLETTER

Volume 22 Number 9

STUDY + LEARN = POWER

August 2014

A DAMACLOID

In October, 2013, an asteroid was discovered in far southern skies. **2013 UQ4** is a large, dark rock 500 miles across in a highly unusual orbit and was added to the Near Earth Asteroid (NEA) list. But within a short time, astronomers realized that it was one of the rarest of all the solar system family: a **Damacloid**.

Damacloids are in reverse orbits where they actually go backwards (retrograde) around the Sun from the far recesses of the solar system to very close to the Sun.

By May 8, it developed a large gas cloud and two weeks ago a long and bright tail began to form as volatile gases spewed from the rock, glowed, and changes by the hour. It is speeding through space at over 50,000 miles per hour making it very difficult to track for earth-based telescopes. Now high in northern skies in the constellation of Cepheus, it is fairly close to the North Star, moving to the northwest and can actually be seen with binoculars.

CENTAURUS A

Astronomers have probed the extreme outskirts of the elliptical galaxy **Centaurus A**. The galaxy's halo of stars has been found to extend much further from the galaxy's center than expected and the stars within this halo seem to be surprisingly rich in heavy elements.

This is the most remote portion of an elliptical galaxy ever to have been explored. We know very little about the haloes of galaxies beyond our own as their faint and spread-out nature makes exploring them more difficult. Astronomers have so far managed to detect very few starry haloes around other galaxies.

CHANDRA

Fifteen years ago the *Chandra X-ray Observatory* was launched into space aboard the Space Shuttle Columbia. It has helped revolutionize our understanding of the universe through its unrivaled X-ray vision.

As one of NASA's current "Great Observatories," along with the Hubble Space Telescope and Spitzer Space Telescope, *Chandra* was specially designed to detect X-ray emission from hot and energetic regions of the universe.

UNUSUAL GALAXIES

The Universe is filled with objects springing to life, evolving, and dying explosive deaths. Embedded within the egg-shaped blue ring at the center of a new *Hubble* image are two elliptical galaxies that have strayed into each other's paths. And clearly for the first time, they **are two separate objects** but will not be able to hold on to their separate identities much longer. See: http://sci.esa.int/science-e-media/img/content/images/2014/heic1414a_565.jpg

COMET IS A BINARY

Rosetta spacecraft images of Comet 67P/C-G supports the presence of two definite components. The comet is actually two comets in one or more technically, a "contact binary." One segment seems to be rather elongated, while the other appears more bulbous. See: <http://sci.esa.int/rosetta/54355-comet-67pc-g-on-14-july-2014-processed-view/>

SUDDEN QUIET

: Just a few two weeks ago, the Sun was peppered with large active regions. But on July 17th the Sun's surface went completely blank – the sunspot count was "zero" No spots for the first time since January 27, 2011.

Is Solar Maximum finished? Probably not, but the ongoing quiet spell is remarkable.

KEPLER 421b

Astronomers have discovered a transiting exoplanet with the longest known year. **Kepler-421b** circles its star once every 704 days. In comparison, Mars orbits our Sun once every 780 days. Most of the 1,800-plus exoplanets discovered to date are much closer to their stars and have much shorter orbital periods.

EXOPLANET WATER CONTENT

Three planets between 60 and 900 light-years away from Earth were thought to be ideal candidates for detecting water vapor in their atmospheres. However, the planets were found to have only one-tenth to one one-thousandth the amount of water predicted by standard planet-formation theories.

HUBBLE'S STRING OF PEARLS

Hubble has photographed a 100,000-light-year-long structure that looks like a string of pearls twisted into a corkscrew shape as it winds around the cores of the two massive galaxies. The "pearls" are superclusters of blazing, blue-white, newly born stars. See: <http://hubblesite.org/news/2014/26>.

UNKNOWN RADIO BURSTS

The discovery of a split-second burst of radio waves by scientists using the Arecibo radio telescope in Puerto Rico provides important new evidence of mysterious pulses that appear to come from deep in outer space. The radio waves show every sign of having come from far outside our galaxy – a really exciting prospect."

Exactly what may be the cause represents a major new enigma for astrophysicists. They confirm previous estimates that these strange cosmic bursts occur roughly 10,000 times a day over the whole sky.

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> ****

NEW MARS MAP -- The US Geological Survey (USGS) published its new global geologic map of Mars, created by the agency with the help of four orbiting NASA spacecraft that have spent 16 years in the sky collecting imagery. See: http://www.usgs.gov/newsroom/images/2014_07_14/Mars_Geo_Topo.jpg

Puzzles

Find The Word

S T E M O C L O U D	ADDED	PATHS
E H N S S L K A N S	BLANK	PEARLS
S L A I E N E R T E	CLOUD	RADIO
A K N P A O R C I T	COMET	SHAPE
G C S L E F L F L K	FAINT	SINCE
E A B R G A I A T S	FIRST	SKIES
S R D R A R R N H H	GASES	SPELL
E T E D S T E L O T	GREAT	STARS
H A L T E T S E S A	GREEN	THESE
T S T O I D A R N D	HALOES	TRACK

Scrambled Astronomy

IN THE WATER

LIGSFDOH _ _ _ _ _

LIDHNOP _ _ _ _ _

SSIHFE _ _ _ _ _

HELAW _ _ _ _ _

BACR _ _ _ _ _

(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 *****

Collision In the Bullet Group - <http://sci.esa.int/xmm-newton/54116-cosmic-collision-in-the-bullet-group/>
Mystic Mountain - <http://scitechdaily.com/images/Hubble-Image-of-the-Day-Mystic-Mountain.jpg>

SITE OF THE MONTH

Arkansas Sky Observatories - <http://www.arksky.org/>

***** MOON IN AUGUST *****

First Quarter: 8/4 **Full Moon:** 8/10 **Last Quarter:** 8/17 **New Moon:** 8/25

Perigee: 8/10 12:44 PM 221,765 mi. (356896 km) **Apogee:** 8/24 1:10 AM 252,630 mi. (406522 km)

** The **August Full Moon** was called the **Red Moon**, **Sturgeon Moon**, and the **Green Corn Moon**.

** **Best observing nights:** 8/1 - 8/4; 8/17 - 8/31 ** The August Full Moon is the closest and largest of the year.

***** PLANETS IN AUGUST *****

VENUS rises in the E about 1½ hours before the Sun all month. **JUPITER**, in the ENE before sunrise, is at the lower left of Venus. They are moving closer each day until just before sunrise on the 18th when Venus is in front of Jupiter by 1/4th of a degree – a rare double planet event and a spectacular sight worth the early rise (*superior conjunction*). Plus, the Beehive Cluster will be only 1° away! **NEPTUNE** will be at its closest approach to Earth on the 29th and directly opposite the Sun as seen from Earth (*opposition*). Due to its extreme distance, it will only appear as a tiny blue dot in all but the most powerful telescopes. **MERCURY** is behind the Sun on the 8th (*superior conjunction*). It is very low in the west on the evening of the 27th and sets after sunrise. **MARS** and **SATURN** are in the western sky and both set about three hours after sunset.

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

<u>NAME</u>	<u>DATES</u>	<u>BEST NIGHT</u>	<u>PER HOUR</u>	<u>WHERE TO LOOK</u>
PERSEIDS	7/17 – 8/24	8/12- 8/13	60 +/-	Half-high in the NNE. Despite the Full Moon on the 12th, the Perseids are so bright and numerous that it will be a good show.
IOTA AQUARIDS	7/1 – 9/18	8/6 and 8/25	7+	This shower has two diffuse branches and is also complicated by two Delta Aquarid streams and several coming from the Capricornus area. August has seven other minor showers.

LOOK FOR >>>>> **Saturn** and **Mars** only 3.4° apart in the SSW on the 25th - 1 1/2 hours after sunset.
>>>>> **Vega** – the brightest star in the northern hemisphere. Just to the northeast is *epsilon Lyrae*. With binoculars it is actually a “double” and in large telescopes, each double is also a “double” – *epsilon Lyrae* is a “double-double”!
>>>>> **Antares**, a huge red supergiant in the SW, is big enough to swallow our Solar System all the way out to Saturn.

JUPITER'S RADIO SIGNALS

A new study reveals that powerful radio signals generated from Jupiter could help researchers scan its giant moons for extraterrestrial life. Jupiter 67 known moons, including three giant icy moons might possess liquid oceans below their frozen surfaces. Astrobiologists want to investigate Europa, Ganymede and Callisto for extraterrestrial life, as there is life virtually wherever there is liquid water on Earth.

HUBBLE MISSION

The *Hubble Space Telescope* will be used to **search** for an object *New Horizons* could visit after its flyby of Pluto in July 2015. The search will involve a small area of sky in search of a Kuiper Belt object --- the Kuiper Belt is a vast debris field of icy bodies left over from the solar system's formation 4.6 billion years ago.

A KBO has never been seen up close because the belt is so far from the Sun, stretching out to a distance of 5 billion miles into the never-before-visited frontier of the solar system.

See: <http://www.nasa.gov/hubble> and <http://hubblesite.org/news/2014/29>

UNUSUAL DUSTY RING

The *Herschel Space Observatory* has uncovered a weird ring of dusty material while obtaining one of the sharpest scans to date of a huge cloud of gas and dust, called **NGC 7538**. The observations have revealed numerous clumps of material, a baker's dozen of which may evolve into the most powerful kinds of stars in the universe.

TEST FAILS

On June 28th, NASA sent a saucer-like vehicle high into the sky to test technology for a future Mars landing, but its parachute tangled and the spacecraft splashed into the Pacific Ocean.

The "*Low-Density Supersonic Decelerator*" saucer-shaped vehicle was attached to a helium balloon the size of a football field, the largest ever deployed. At 120,000 feet, it detached the saucer which fired its rocket engine and rose to 180,000 feet traveling at 3.8 times the speed of sound. The engine was cut off and a doughnut-shaped inflatable device around the saucer slowed the saucer's descent to 2.5 times the speed of sound when the parachute failed.

"DIAMOND" IN SPACE?

A team of astronomers has identified possibly the coldest, faintest white dwarf star ever detected. This ancient stellar remnant is so cool that its carbon has crystallized, forming -- in effect -- **an Earth-size diamond**.

White dwarfs are the extremely dense end-states of stars like our Sun that have collapsed to form an object approximately the size of the Earth. Composed mostly of carbon and oxygen, white dwarfs slowly cool and fade over billions of years. The object in this new study is likely the same age as the Milky Way, approximately 11 billion years old.

BLACK HOLE WINDS

An international team of astronomers discovered unexpected behavior from the supermassive black hole at the heart of the galaxy **NGC 5548**. A stream of gas up to 3,107 miles per second is much closer to the nucleus, blocking 90 percent of its emitted X-rays.

In 2011 much colder gas was present than earlier, due to a significant decrease in X-ray radiation from the galaxy's nucleus.

SPINELS

For 50 years, scientists have wondered what annihilated the ancestor of L-chondrites, meteorites that frequently pummel Earth. A new kind of meteorite discovered in a southern Sweden limestone quarry may finally solve the mystery, scientists report. It may be the missing "other half" from one of the biggest interstellar collisions in a billion years.

Scientists now know that each kind of meteorite leaves behind a unique calling card: tough minerals called spinels. Even if meteorites weather away, their **spinels** linger for hundreds of millions of years in Earth rocks,

TITAN'S SALTY OCEAN

Scientists analyzing *Cassini* data have firm evidence the ocean inside Saturn's largest moon, Titan, might be as salty as the Earth's Dead Sea. The new results come from a study of gravity and topography data collected during Cassini's repeated flybys of Titan during the past 10 years.

BERYLLIUM-10

The formation of isotope **beryllium-10**, in the Universe is an intricate puzzle of its own. It is not produced in the interior of stars or supernova explosions.

The majority was formed in collisions of very energetic particles with heavier elements like oxygen. But since this isotope decays very quickly into other elements, it must have been produced just before it was incorporated in the rocks that would later appear on Earth as meteorites.

ROSETTA

After a 10-year voyage across the solar system, the *Rosetta* spacecraft is drawing closer to its goal --- Comet **67P/Churyumov-Gerasimenko**. On June 6th it made the first observations of water vapor streaming from the comet. Since the initial detection, water vapor has been found every time *Rosetta*'s camera **MIRO** has been pointed towards the comet.

Mission scientists said: "*We always knew we would see water vapor outgassing from the comet, but were surprised at how early we detected it. At this rate, the comet would fill an Olympic-size swimming pool in about 100 days. But, as it gets closer to the Sun, the gas production rate will increase significantly.*"

Rosetta arrives at a distance of 60 miles from the comet's nucleus on August 6th and then will make the nearest approach to the Sun in August 2015, between the orbits of Earth and Mars.

EXOPLANET ANSWER

Mysteries about controversial signals coming from a dwarf star considered to be a prime target in the search for extraterrestrial life now have been solved.

Penn State scientists have proven that some of the signals, which were suspected to be coming from two planets orbiting a star at a distance where liquid water could potentially exist, actually are coming from inside the star itself, not from so-called "Goldilocks planets" where conditions are just right for supporting life.

NEW SKA ANTENNA IN CHILE

General Dynamics' SATCOM Technologies in Newton, NC, will build and install a 100-ton, 12-meter (40-foot), radio telescope antenna for the new **Large Latin American Millimeter Array** (LLAMA) observatory in Chile. The new antenna will join the 25 SATCOM antennas now in operation.

The LLAMA project is a joint venture between Argentina and Brazil to provide scientists with a high-powered 'lens' to study black holes, the molecular evolution of interstellar clouds and the structure of the universe.

The new antenna will be similar to the 25 SATCOM antennas at the ALMA observatory 200 km (124 miles) from the LLAMA site, in the Chilean portion of the Atacama Desert. An example of the array design concept is the Square Kilometer Array (SKA) in South Africa. SATCOM Technologies is also building the 64 MeerKat radio telescope antennas for the SKA.

COLD EXOPLANET FOUND

OGLE-2013-BLG-0341Lb is a newly discovered planet in a binary star system 3,000 light-years from Earth. At twice the mass of Earth, the planet orbits one of the stars in the binary system at almost exactly the same distance as Earth orbits the Sun. because the planet's host star is much dimmer than the Sun, the planet is much colder than Earth.

THE CASSINI GRAND FINALE

With input from more than 2,000 members of the public, team members on NASA's *Cassini* mission to Saturn have chosen a name for the final phase of the mission: the ***Cassini Grand Finale***.

Starting in late 2016, *Cassini* will begin a set of orbits repeatedly climbing high above Saturn's north pole and probing the water-rich plumes of the active geysers on Saturn's moon Enceladus. It will then move below and above the planet's F-Ring 22 times.

COSMIC DUST

Cosmic dust comes from supernova explosions but astronomers have been puzzled as to how it can possibly survive violent shock waves. Now they have not only watched one of these supernova "dust factories" in action, they've also discovered how the grains can withstand the violent supernova shock.

And scientists are beginning to realize how these dust factories work, ultimately seeding the Universe with rocky planets like Earth and the organic chemistry that resides on them.

THE BUNBURRA ROCKHOLE METEORITE

A well-known 2007 Australian meteorite was the first to be tracked by ground-based cameras as it blasted through the Earth's atmosphere. It has been recovered at its Australian fall site and identified as a geological oddity.

After recent isotopic tests, its basaltic composition started a cosmic forensics investigation that has led researchers to believe it originated from an asteroid that no longer exists.

Most basaltic meteorites are thought to originate from the asteroid (or protoplanet) Vesta. Basaltic rock forms from volcanic activity and it is believed that early in Vesta's formation 4.5 billion years ago, vulcanism extinguished the majority of Vesta's heat. Any basaltic meteorites originating from Vesta can be dated to 4.5 billion years old. Until now the only basaltic meteorites known came from asteroid Vesta.

SEVEN NEW DWARF GALAXIES

Yale University astronomers, using a new type of telescope made by stitching together telephoto lenses, recently discovered seven previously unseen dwarf galaxies near M 101. This may yield important insights into dark matter and galaxy evolution, while possibly signaling the discovery of a new class of objects in space.

In addition to discovering new galaxies, the team is looking for debris from long-ago galaxy collisions and said, "It's a new domain. We're exploring a region of parameter space that had not been explored before."

HERSCHEL SHUTDOWN

On June 17th, *Herschel Space Telescope* operations were concluded, following the last maneuver to deplete its fuel and setting the spacecraft in a quiet state.. Herschel is in its final heliocentric orbit and the mission is now in its post-operations phase. A final entry in the series of Herschel status reports, which covered the activities of the mission during in-flight operations, is in an archive of all Herschel status reports running from October 2009 to June 2013.

MARS – COMET FLYBY

NASA is taking steps to protect its Mars orbiters, while preserving opportunities to gather valuable scientific data, as ***Comet C/2013 A1 Siding Spring*** heads toward a close flyby of Mars on October 19th. The comet's nucleus will miss Mars by about 82,000 miles, shedding material hurtling at about 35 miles per second, relative to Mars and Mars-orbiting spacecraft. At that velocity, even the smallest particle -- estimated to be about one-fiftieth of an inch (half a millimeter) across -- could cause significant damage to a spacecraft.

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