

THE YOUNG ASTRONOMERS NEWSLETTER

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STUDY + LEARN = POWER

July 2015

SCHOOLBOY'S DISCOVERY OF WASP-142b

In 2013, a 15-yr-old schoolboy discovered a new planet orbiting a star 1000 light years from Earth in the Milky Way galaxy. Tom Wagg was doing work-experience at Keele University in England when he spotted the planet by finding a tiny dip in the light of a star as a planet passed in front of it.

Tom, now aged 17, used two years of further observations to prove that the discovery really is a planet. **WASP-142b** is in the Southern constellation of **Hydra**. While astronomers worldwide have now found over 1000 extra-solar planets, Tom is possibly the youngest ever to have done so.

"HELLO EARTH"

Philae touched down on the **67P/Churyumov-Gerasimenko comet** after an epic 10-year trek piggybacking on the **Rosetta** lander. Philae awoke on June 7th and sent home its first message in nearly seven months. Mission officials declared **Philae** may soon resume science work, opening up a new chapter in its exhilarating voyage.

"IMPACT GLASS" ON MARS?

The *Mars Reconnaissance Orbiter* (MRO) has detected deposits of glass within impact craters on Mars. Though formed in the searing heat of a violent impact, such deposits might provide a delicate window into the possibility of past life on the Red Planet.

Past life has been preserved in impact glass here on Earth. A search in 2014 found organic molecules and plant matter entombed in glass formed by an impact that occurred millions of years ago in Argentina.

<http://www.spxdaily.com/images-ig/impact-glass-mars-alga-crater-ig.jpg>

LIGHTSAIL

Born in 1999, **cubesats** are miniaturized and inexpensive satellites doing the stuff of regular satellites — tracking stars and beaming telecommunications.

A cubesat named **LightSail**, a **solar sail** (the size of a boxing ring) was launched on May 20th with its massive wings packed into a container the size of a bread box. Following a 25-day stay in low-Earth orbit, it made a fiery re-entry into Earth's atmosphere on June 15th.

See: <http://www.planetary.org/blogs/jason-davis/2015/20150608-sails-in-space.html>

MOON'S DUST CLOUD

The Moon is engulfed in a permanent but lopsided dust cloud that is made up primarily of tiny dust grains kicked up from the Moon's surface by the impact of high-speed, interplanetary dust particles

HUBBLE'S 25TH ANNIVERSARY IMAGE

A brilliant tapestry of young stars flaring to life resemble a glittering fireworks display is the "25th Anniversary NASA Hubble Space Telescope Image" released to commemorate a quarter century of exploring the solar system and beyond since its launch on April 24, 1990. See: <http://hubblesite.org/news/2015/12>

ROCKETRY CHALLENGE WINNERS

Seven students from the Russellville City Schools of Russellville, Alabama won first place in the International Rocketry Challenge at the 2015 Paris Air Show on June 19th. The U.S. team, sponsored by Raytheon, beat teams from the United Kingdom, who came in second place, and France, who took home third. The U. S. students' presentation on their rocket design to a panel of international judges took first place in this portion of the challenge as well.

"ICY" PLANETS AND MOONS

The interiors of several of our Solar System's planets and moons are icy, and ice has been found on distant extrasolar planets, as well. But the ice that's found inside these objects must exist under extreme pressures and high-temperatures, and can contain salty impurities also.

When water (H₂O) freezes into ice, the molecules are bound together in at least 16 different structures held together by hydrogen bonds that could not exist in the interiors of frozen planets and moons. But pressures can increase to around 600,000 times Earth's atmosphere which would be comparable to the pressure conditions found in the interior of an icy-cored planet, like Neptune.

RE-BORN BLACK HOLE

ESA's *Integral* satellite has been observing an exceptional outburst of high-energy light produced by a black hole in **V404Cygni** that has started devouring material from its stellar companion once again. First detections triggered a massive campaign of observations from ground-based telescopes and space-based observatories. ESA's Erik Kuulkers said: "The behavior is extraordinary with repeated bright flashes of light on time scales shorter than an hour, something rarely seen in other black hole systems."

DEEP IMPACT

On July 4, 2005, the *Deep Impact Flyby* spacecraft released a washing-machine-sized probe that collided spectacularly with comet **Tempel 1** at 23,000 mph, while the main craft observed the results.

The explosive impact gave scientists their first-ever view of pristine material from inside a comet's nucleus—the solid central lump of ice and debris that gives a comet its shape. Much to the surprise of scientists and contrary to most theoretical models, Tempel 1 had a fairly uniform composition of ices, with proportions near the surface being similar to those 20 meters deep.

DARK GALAXIES DISCOVERY

A group of researchers from the Stony Brook University (the State University of New York) and the National Astronomical Observatory of Japan has discovered 854 "ultra dark galaxies" in the **Coma Cluster** by analyzing archival data from the Subaru Telescope. The discovery of 47 such mysterious dark galaxies was a surprising find in 2014, and a new discovery of more than 800 suggests galaxy clusters as the key environment for the evolution of these mysterious dark galaxies.

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> ***

ALSO >>> Japan's SoftBank said that its chatty humanoid robot **Pepper** would go on sale and announced a deal with Alibaba, to work on robotics technology. Local media said Alibaba was trying to attract Chinese consumers to the wise-cracking robot, which is already being used to sell coffee machines!

Puzzles

FIND THE WORD

H Y D R A M A E T S	APART	GIANT
G R A I N S E P P E	BREAD	GRAINS
I T E R M S T D E T	CHASE	HYDRA
A N R P A R N P I C	COFFEE	IMPACT
N E B E P P A R H A	EARTH	LIGHT
T E E Y A E L D T P	ENTRY	MEDIA
H S V R R E P N R M	FIERY	PEPPER
G A R E T E O U A I	FIRST	PLANT
I H R I S R M O E P	FOUND	SEVEN
L C O F F E E F C E	FRONT	STEAM

SCRAMBLED ASTRONOMY

ANIMALS IN THE SKY

CUICRON	_____
OLFW	_____
DGRONA	_____
SHORE	_____
LOAF	_____

(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** *****

Triple crescent moons - <http://scitechdaily.com/triple-crescent-moon-image-from-cassini/>

Titan's lakes - <http://scitechdaily.com/cassini-views-lakes-saturns-moon-titan/>

A solar prominence video - <http://sdo.gsfc.nasa.gov/gallery/potw/item/617>

SITE OF THE MONTH

Global science news - <http://www.eurekalert.org/>

***** **MOON IN JULY** *****

Full Moon: 7/2 **Last Quarter:** 7/8 **New Moon:** 7/16 **First Quarter:** 7/24 **Full Moon:** 7/31

Perigee: 7/5 2:51 PM 228,101 mi. (367,093 km) **Apogee:** 7/21 6:59 AM 251,558 mi. (404,843 km)

** The Full Moon was called the Thunder Moon and Hay Moon. ** **Best observing nights:** 7/8 – 7/24

** The second Full Moon in a month is a "BLUE MOON". The last was in August 2012, the next - March 2018.

***** **PLANETS IN JULY** *****

JUPITER and **VENUS** are low in the SW twilight and start the month only .6° apart. They are moving lower each night and set just after sunset by the 31st. **MARS** is out of the Sun's glare on the 31st but hard to spot. **SATURN** is in the South in morning twilight. **MERCURY** is in the ENE at dawn during the first half of July.

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

<u>NAME</u>	<u>DATES</u>	<u>BEST NIGHT</u>	<u>PER HOUR</u>	<u>WHERE TO LOOK</u>
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(During July and August the Aquarid-Capricornid complex becomes active with a variety of radiants, Two are:)

SOUTHERN DELTA AQUARIDS 7/21 – 8/23 7/27 15 - 20 Low in the East. This shower is produced by the **Marsden** and **Kracht** group of sun-grazing comets first observed in 1871. It was later attributed to Comet 169P/NEAT as being created about 3,500 to 5,000 years ago.

CAPRICORNIDS 7/5 – 8/15 7/29 5+ Low in the east near the Aquarids. There are 6+ minor showers this month.

LOOK FOR: >>>> **SATURN** in the SE just above the claws of Scorpius. The rings are tilted about 24° and provide an outstanding site with a telescope and binoculars. >>>> **CYGNUS** the Swan "flying" in the NE sky. >>>> **VENUS** and **JUPITER** as they slowly move apart all month. >>>> **SPECIAL GROUPINGS:** § Regulus, Venus and Moon crescents with Jupiter in W on the 18th after sunset. § Saturn and Scorpius double stars in S after sunset on the 16th. § The Sagittarius Teapot in the S with a "steam cloud" at the spout (M8, the Lagoon Nebula).

PLUTO'S MOONS

Analysis of *Hubble* data shows that two of Pluto's moons, **Nix** and **Hydra**, wobble unpredictably. They wobble because they're embedded in a gravitational field that shifts constantly. This shift is created by the double planet system of **Pluto** and **Charon** as they whirl about each other. (**Pluto** and **Charon** are called a *double planet* because they share a common center of gravity located in the space between the bodies that sends the smaller moons tumbling erratically.

The effect is strengthened by the football-like shape of the moons. Scientists believe Pluto's other two moons, **Kerberos** and **Styx**, may be in a similar situation.

See: <http://www.nasa.gov/hubble> and
<http://hubblesite.org/news/2015/24>

SURPRISES IN COMET'S COMA

Rosetta's continued close study of **Comet 67P/Churyumov-Gerasimenko** has revealed an unexpected process causing the rapid breakup of water and carbon dioxide molecules to spew from the comet's surface. Since the **Rosetta** mission arrived at the comet in August last year, it has been orbiting or flying past the comet at distances from several hundred miles to as little as 5 miles collecting data on every aspect of the comet's environment.

Rosetta's Alice spectrograph has more than 1,000 times the data-gathering capability of instruments flown a generation ago, weighs less than nine pounds and draws only 4 watts of power See: <http://www.jpl.nasa.gov/spaceimages/details.php?id=pia18899>

MARSPOLAR

MarsPolar, a newly started international venture is setting its sights on the Red Planet. The project consisting of specialists from Russia, United Arab Emirates, Poland, U.S. and Ukraine has come up with a bold idea to establish a human settlement on Mars' polar region, the part of the planet with abundant quantities of water ice. The targeted area could be very interesting.

"PLASMA TUBES"

By observing galaxies as far as billions of light-years away, a team of astronomers detected **tube-like structures** of plasma just hundreds of miles above the Earth's surface. Mapping the variations in the positions of multiple radio sources over the course of a night revealed the shape and dimensions of the tube structures. They created a movie - effectively capturing the real-time motions of the tubes.

CRAB NEBULA

The Crab Nebula (**M1**, **NGC 1952** and **Taurus A**) is the remnant of a supernova explosion first recorded by Chinese astronomers in 1054. The tangled filaments visible are the remains of the exploded star, which are still expanding outwards at about 900 miles per second.

A small, faint star - the **Crab Pulsar**, or **CM Tau** is a dense, corpse of the original star that caused the supernova. It is now only about 13 miles in diameter and rotates around its axis 30 times every second! It emits pulses of radiation in all wavelengths that are so strong they are creating a wave of material which is deforming the inner parts of the nebula.

See: <http://www.eso.org/public/usa/images/potw/>

L2 PUPPIS

ESO's Very Large Telescope has, for the first time, revealed what appears to be an ageing star giving birth to a butterfly-like planetary nebula. These observations of the red giant star **L2 Puppis**, also clearly showed a close stellar companion. The dying stages of stars continue to pose astronomers with many riddles, and the origin of such bipolar nebulae, with their complex and alluring hourglass figures, doubly so. See:

<http://www.eurekalert.org/multimedia/pub/93184.php>
NGC 5813

Astronomers have used *Chandra* to show that multiple eruptions from a supermassive black hole over a 50 million year period have rearranged the cosmic landscape at the center of a **group of galaxies**, **NGC5813**.

The *Chandra* observations are the longest ever obtained of a **galaxy group**. **Galaxy groups** are like their larger cousins, **galaxy clusters**, but instead of containing hundreds or even thousands of galaxies, **galaxy groups** are typically comprised of 50 or fewer galaxies. The erupting supermassive black spin and gas spiraling toward the black hole, can produce a rotating, tightly wound vertical tower of magnetic field that flings a large fraction of the inflowing gas away from the vicinity of the black hole in an energetic, high-speed jet.

See: <http://www.spxdaily.com/images-lg/composite-x-ray-optical-ngc-5813-lg.jpg>

HELIUM ON EXOPLANETS

Using *Spitzer* data, astronomers propose that helium atmospheres may be found on thousands of warm **Neptune- and sub-Neptune-sized** exoplanets in the Milky Way galaxy. They say that the close proximity of these planets to their searing stars would cause the hydrogen in their atmospheres to boil off.

And: "Hydrogen is four times lighter than helium, so it would slowly disappear from the planets' atmospheres, causing them to become more concentrated with helium over time taking up to 10 billion years to complete."

CLOUD D

A team of Tel Aviv University and UCLA astronomers has discovered a remarkable cluster of more than a million young stars forming in a hot, dusty cloud of molecular gases in a tiny galaxy very near the Milky Way. The cluster is buried within a massive gas cloud dubbed "**Cloud D**" in the **NGC 5253** dwarf galaxy, and is barely visible, hidden by its own hot gases and dust. The star cluster contains more than 7,000 **massive "O" stars**: the most brilliant stars -- each a million times more luminous than the Sun.

According to the researchers, **NGC 5253** is home to hundreds of large star clusters. The most spectacular cluster in the massive **Cloud D**, is about three million years old, remarkably young in astronomical terms.

EXOPLANET'S "SUNSCREEN"

Researchers say they've identified a protective stratosphere-like layer around an exoplanet called **WASP-33b**. The layer acts a sort of sunscreen, protecting the blazing hot planet from ultraviolet light.

They said: "Some of these planets are so hot in their upper atmospheres they're boiling off into space."

LILLER 1

Liller 1 is a tight sphere of stars known as a globular cluster -- they orbit in a large halo around the center of a galaxy and many of the closer globular clusters are spectacular showpieces. **Liller 1** is a difficult target to study due to its distance and also because it is located close to the center of the Milky Way where the amount of dust is very high.

Stars are so densely packed that it is likely a rare environment where stars can collide. It is a vast "city of stars" estimated to contain a total mass of at least 1.5 million suns, very similar to the most massive globular clusters in our galaxy: **Omega Centauri** and **Terzan 5**.

See: http://www.gemini.edu/images/pio/News/2015/pr2015_03/Liller1_Med.jpg

OEMA

OEMA (Northern Extended Millimeter Array), the most powerful **millimeter radio telescope** of the Northern Hemisphere, has unveiled its first astronomical image: a unique and spectacular view of a previously unknown region of extreme star formation in the "**Medusa merger**" - a luminous collision of two galaxies at more than 100 million light years from Earth.

See: <http://www.spxdaily.com/images-lg/eye-of-medusa-below-black-hole-center-ngc-4149-lg.jpg>
SATURN'S "HOTSPOTS"

Curious "hotspots" on Saturn's poles are immense cyclones as wide as Earth that may whip up 300 mph winds and likely have been churning for years. While cyclones on Earth are fueled by the heat and moisture of the oceans, no such bodies of water exist on Saturn.

Scientists at MIT propose that, over time, small, short-lived thunderstorms across the planet may build up angular momentum, or spin, within the atmosphere - ultimately stirring up massive and long-lasting rotations of the winds at the poles.

KEPLER-138b

Researchers have measured the mass of an exoplanet about one tenth the size of Earth. **Kepler-138b** is the first exoplanet smaller than Earth to have both its mass and size measured. Each time a planet transits a star it blocks a small fraction of the star's light, allowing astronomers to measure the size of the planet. By measuring both the mass and size, scientists can calculate the density and infer the bulk composition to determine if a planet is made of rock, water or gas.

FIRST GENERATION OF STARS

Astronomers have long theorized the existence of a first generation of stars that were born out of the primordial material from the Big Bang. All the heavier chemical elements (oxygen, nitrogen, carbon and iron, which are essential to life) were forged inside these stars. This means that the first stars must have formed out of the only elements to exist prior to stars: hydrogen, helium and trace amounts of lithium.

EARTH'S CORE

New research confirms that the Earth's core does in fact contain vast amounts of sulphur, estimated to be more than 1000 tons. This is about 10 times the amount of sulphur in the rest of the Earth, based on the most recent estimates.

QUASAR SOLUTION

Astronomers have used *Hubble's* infrared vision to uncover the mysterious early formative years of quasars, the brightest objects in the universe.

They said: "*Hubble's* sharp images are definitely telling us that the peak of quasar activity in the early universe was driven by galaxies colliding and then merging together."

As galaxies merge, gravitational forces cause the gas in the disks of the colliding galaxies to fall directly toward the supermassive black hole.

The accretion zone around the black hole is so engorged with fuel it converts it into a gusher of radiation that blazes across the universe. The lingering question has been what turns these brilliant beacons on, and now *Hubble* has provided the best solution.

See: <http://www.eurekalert.org/multimedia/pub/93999.php>

BASHFUL BLACK HOLE

Thanks to the extraordinary sensitivity of the **Karl G. Jansky Very Large Array** (VLA), astronomers have detected what they believe is the long-sought radio emission coming from a supermassive black hole at the center of one of our closest neighboring galaxies.

The galaxy, **M32**, is a satellite of the Andromeda Galaxy. It is an elliptical galaxy with little star formation and much smaller than either the Milky Way or Andromeda. See:

https://public.nrao.edu/images/non-gallery/2015/d-finley/06-16-M32/M32zoom_nrao.jp

HOT SPOTS ON VENUS

An international team of scientists has some of the best evidence yet that Venus is volcanically active. The scientists found transient spikes in temperature at several spots on the planet's surface that were found to flash and fade over the course of just a few days. They appear to be generated by active flows of lava on the surface.

The spots were clustered in a large rift zone called **Ganiki Chasma** which was the result of volcanism that occurred fairly recently in geological terms. The scientists said they "- didn't know if it formed yesterday or was a billion years old."

HCG 16

A group of four galaxies known as the **Hickson Compact Group 16**, or HCG 16, is a galaxy group bursting with dramatic star formation, tidal tails, galactic mergers and black holes.

This quartet is composed of **NGC 839**, **NGC 838**, **NGC 835**, and **NGC 833** - four of the seven galaxies that make up the entire **Hickson** group. They shine brightly with their glowing golden centers and wispy tails of gas set against a background dotted with much more distant galaxies. See:

<http://www.eurekalert.org/multimedia/pub/93930.php>
and https://en.wikipedia.org/wiki/Hickson_Compact_Group