

THE YOUNG ASTRONOMERS NEWSLETTER

Volume 23 Number 7

STUDY + LEARN = POWER

June 2015

MAJOR EVENT THIS MONTH - - - WATCH JUPITER AND VENUS

SUPERFLARES ON EXOPLANETS

A team of Japanese astronomers observed "superflares" on solar-type stars emitting these very large flares that release total energies 10-10000 times greater than the Sun's biggest flares. Solar flares are energetic explosions in the solar atmosphere and are thought to occur by intense releases of magnetic energy around sunspots.

Our Sun's large flares often cause massive bursts of high-speed plasma (**coronal mass ejections** - CMEs), that can lead to geomagnetic storms on Earth.

See: <http://subarutelescope.org/Pressrelease/2015/05/11/fig1e.png>

WHITE DWARF MIGRATION

Astronomers have, for a "first time", collected a census of young white dwarf stars beginning their migration from the crowded center of an ancient star cluster to its less populated outskirts.

They knew about this process but had not seen it in action. Astronomers used Hubble to trace this stellar journey by studying 3000 white dwarfs in the globular star cluster **47 Tucanae**, a dense swarm of hundreds of thousands of stars in the Milky Way.

See: <http://www.spxdaily.com/images-lg/heart-giant-globular-star-cluster-47-tucanae-lg.jpg>

CHINA'S SPACE PROGRAM

A recent report released by the Department of Defense warns of China's rapidly growing space program, insisting that many of Beijing's space activities are aimed at countering the space capabilities of adversaries in the event of a crisis or conflict.

The United States expressed concern that China's continued development of destructive space technologies represented a threat to all peaceful space-faring nations, and was inconsistent with China's public statements about the use of space for peaceful purposes.

MEDUSA NEBULA

A new image from the European Southern Observatory is the most detailed image ever taken of the **Medusa Nebula**. Astronomers captured the image as the star at the heart of this nebula made its transition into retirement. See: <http://scitechdaily.com/images/>

[New-ESO-Image-of-the-Medusa-Nebula.jpg](http://scitechdaily.com/images/)

ROSETTA AND COMET 67P

While analyzing images collected by the *Rosetta* probe, scientists spotted a "balancing" rock among dust and crags of Comet 67P.

The teetering boulder appears to stretch vertically and make minimal contact with the ground. Like balancing rocks found on Earth it appears as if it could topple over at any moment. The rock looks to be resting on the rim of a small depression.

See: <http://www.spxdaily.com/images-lg/comet-67pc-g-aker-region-three-boulders-lg.jpg>

OPTIMUS PRIME SPINOFF CHALLENGE

Which of NASA's space-venturing creations would you like to see used on Earth? Are there ways to reinvent spacecraft technologies that could improve the lives of humans? This year, the challenge had two components.

The **OPTIMUS PRIME Video Challenge** asked elementary through high school students to produce a video highlighting their technology spinoff creations. The **InWorld Challenge** required sixth through 12th graders to use ideas generated by the Video Challenge to build a 3-D computer version of their designs. See: http://itpo.gsfc.nasa.gov/optimus/2014_workshop.php

FLUFFY GALAXIES

An international team of researchers has confirmed the existence of the most diffuse class of galaxies known in the universe. These "**fluffiest galaxies**" (named **Ultra Diffuse Galaxies** - UDGs) are nearly as wide as our own Milky Way galaxy yet harbor only one percent as many stars. They were found in an area of the sky called the **Coma cluster** where thousands of galaxies have been drawn together in a mutual gravitational dance.

"ALIVE" AND "DEAD" GALAXIES

How do galaxies die and what kills them? A new study has found that the primary cause of galactic death is strangulation, which occurs after galaxies are cut off from the raw materials needed to make new stars. There are two types of galaxies in the Universe: roughly half are "alive" galaxies which produce stars, and "dead" which don't.

The "alive" galaxies such as our own Milky Way are rich in the cold gas (mostly hydrogen) needed to produce new stars, while dead galaxies have very low supplies. But what is causing this is not known.

A QUADRUPLE QUASAR !

A group of astronomers has discovered the first **quadruple quasar**: four rare active black holes close to one another. The quartet resides in the **Jackpot Nebula**, one of the most massive structures ever discovered in the distant universe, and, is surrounded by the giant nebula's cloud of cool gas. Quasars constitute a brief phase of galaxy evolution shining hundreds of times brighter than their host galaxies, which themselves contain hundreds of billions of stars.

See: http://www.huffingtonpost.com/2015/05/18/four-quasars-discovery-stronomers_n_7292566.html

NEW TYPE OF GLOBULAR CLUSTER

ESO observers have discovered a new class of "**dark**" **globular star clusters** around the huge elliptical galaxy **NGC 5128** (Centaurus A). It is the closest such galaxy to Earth. **Globular star clusters** are huge balls of thousands of stars that orbit most galaxies. The dark globulars appear very similar to other globulars around this galaxy but contain much more mass. See:

<http://www.eso.org/public/usa/news/eso1519/> and <http://messier.seds.org/xtra/ngc/n5128.html>

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> ***

SUPER-LUMINOUS GALAXY A galaxy so bright it shines with the luminosity of 300 trillion Suns has been discovered by the *WISE* spacecraft. A black hole with an insatiable appetite for gas is believed to be at the center of the galaxy. A scientist said: "This dazzling light may be from a main growth spurt of the galaxy's black hole."

Puzzles

FIND THE WORD

| | | |
|---------------------|--------|-------|
| A S G A R C L O S E | BEEFED | ORDER |
| S E K A O H T R O N | BLAST | OTHER |
| T R C R U H A D L D | CHECK | RISES |
| O U E G E T N E V E | CLOSE | ROVER |
| P S H R S G S R E F | CORES | SOLVE |
| S N C P F O I A Y E | CRAGS | SPEED |
| R E E O H S R D L E | DATES | SPOTS |
| E E U T E L U M L B | EARLY | STARS |
| D N B S Y T H E I R | ENSURE | STUDY |
| D A T E S R E V O R | EVENT | THOSE |

SCRAMBLED ASTRONOMY

SPACE PROBES

CANRHAD _ _ _ _ _

TEZSRIP _ _ _ _ _

SCANSNI _ _ _ _ _

SEWI _ _ _ _

NTRAUS _ _ _ _ _

(Answers below)

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 *****

Neatly-shaped galaxy - <http://scitechdaily.com/images/Hubble-Revisits-Galaxy-NGC-6240.jpg>

Saturn's moon Janus - <http://scitechdaily.com/images/Cassini-Image-of-Janus.jpg>

SITE OF THE MONTH

Samsung's "Solve for Tomorrow" - <http://www.samsung.com/us/solvefortomorrow/contest/>

***** MOON IN JUNE *****

Full Moon: 6/2 **Last Quarter:** 6/9 **New Moon:** 6/16 **First Quarter:** 6/24

Perigee: 6/10 12:43 AM 229,731 mi. (369,716 km) **Apogee:** 6/23 12:58 PM 251,116 mi. (404,132 km)

** The Full Moon was called the Rose, Honey, Flower, and Planting Moon. ** Best observing nights: 6/11 – 6/23

***** PLANETS IN JUNE *****

JUPITER and **VENUS** are shining brightly in the SW sky after sunset. They start the month 20° apart and gradually move closer all during June. Then on the 30th, they are at a spectacular .3° apart. They appear to be the same size but Jupiter, 12 times the size of Venus, is actually 12 times further away. **SATURN** rises in the ESE at sunset and is alone in the SW at dawn. The next "big show" is on December 21st when **Jupiter and Saturn will be only .1° apart – their closest since 1623.**

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

| <u>NAME</u> | <u>DATES</u> | <u>BEST (pre-dawn)</u> | <u>PER HOUR</u> | <u>WHERE TO LOOK</u> |
|---------------------|--------------|------------------------|-----------------|--|
| JUNE BOOTIDS | 6/22 – 7/2 | 6/27 | Var. | Overhead. There was an outburst in 1916 but relatively weak since. Parent body is Comet Pons-Winnecke with its next visit in 2018. |
| ARIETIDS | 5/14 – 6/24 | 6/7 | 60+ | Low in the North, This is the most intense daytime meteor shower and also produces some observable activity with fireballs. |

There are 11 other showers in June – minor and southern.

LOOK FOR: >>>> Blue-white **VEGA**, the brightest star in the Northern Hemisphere, rises in the NE late in the evening twilight. Vega's constellation, **Lyra the harp**, is a parallelogram but was seen as a harp in early Greek legends. >>>> More challenging is the **double-star close to Vega**. >>>> **ANTARES**, low in the SE. It is a bloated, red supergiant in Scorpius, the brightest of all the constellations.

SUPERNOVAS AND GRB'S

Astronomers have found a long-sought "missing link" between supernova explosions that generate gamma-ray bursts (GRBs) and those that don't.

When nuclear fusion reactions at the core of a very massive star no longer can provide the energy needed to hold up the core against the weight of the outer parts of the star, the core collapses catastrophically into a superdense neutron star or a black hole.

The rest of the star's material is blasted into space in a supernova blast with the star's material moving outward in a nearly-spherical bubble that expands rapidly, but at speeds far less than that of light. These explosions produce no burst of gamma rays.

In a small percentage of cases, the material is drawn into a short-lived swirling disk generating jets of material that move outward from the disk's poles at speeds approaching that of light. This combination of a swirling disk and its jets is called an "engine," and this type of explosion produces gamma-ray bursts.

"RUNAWAYS"

To date, about two dozen runaway stars and one runaway star cluster escaped a parent galaxy forever. Now, astronomers have spotted 11 more **runaway galaxies** that have been flung out of their homes to wander the void of intergalactic space. A **runaway star's** speed is more than a million miles per hour. It can be created if a binary star system wanders close to the black hole at the center of a galaxy. One star is captured while the other is thrown away at tremendous speed.

Similarly, a **runaway galaxy** (now called **a compact elliptica**) could be paired with the big galaxy that stripped it of its stars. Then a third galaxy blunders into the dance and flings the compact elliptical away at speeds up to 6 million miles per hour.

HOT VENT MOLECULES

Hot vents on the seabed could have spontaneously produced the organic molecules necessary for life, according to new research by UCL chemists. The study shows how the surfaces of mineral particles inside hydrothermal vents have similar chemical properties to enzymes, the biological molecules that govern chemical reactions in living organisms.

This means that vents are able to create simple carbon-based molecules, such as methanol and formic acid, out of the dissolved CO₂ in the water.

It is proof that simple organic molecules can be synthesised in nature without living organisms being present. It also confirms that hydrothermal vents are a plausible location for at least part of this process to have occurred.

PLANETARY SYSTEM

A team of astronomers using ground-based telescopes in Hawaii, California, and Arizona recently discovered a planetary system orbiting a nearby star that is only 54 light-years away. Three planets orbit their star at a distance closer than Mercury orbits the Sun, completing their orbits in just 5, 15, and 24 days. The team discovered the new planets by detecting the wobble of the star **HD 7924** as the planets orbited and pulled on the star gravitationally.

EXTRASOLAR PLANETS

As the search continues for Earth-size planets orbiting at just the right distance from their star, a region termed the habitable zone, the number of potentially life-supporting planets grows. In two decades we have progressed from having no extrasolar planets to having too many to search. Since the landmark discovery in 1995, more than 1900 exoplanets in 1200 planetary systems have been confirmed.

51 PEGASI B

The exoplanet **51 Pegasi b** was discovered in 1995 and the first confirmed exoplanet to be found orbiting an ordinary star like the Sun. It is a **hot Jupiter** -- a class of planets now known to be relatively commonplace, similar in size and mass to Jupiter, but orbit much closer to their parent stars.

A new technique allows the planetary characteristics to be directly detected in visible light, which means that different characteristics of the planet that are inaccessible to other techniques can be inferred. **51 Pegasi b** was found to be larger than Jupiter in diameter and highly reflective. These are typical properties for a hot Jupiter that is very close to its parent star and exposed to intense starlight.

UNUSUAL BLACK HOLE

Dartmouth astrophysicists and their colleagues have not only proven that a supermassive black hole exists in a place where it isn't supposed to be, but in doing so have opened a new door to what things were like in the early universe.

Henize 2-10 is a small irregular galaxy with regions of very rapid star formation -- about 10 percent of the size of our own Milky Way. They analyzed a series of four X-ray observations using three space telescopes over 13 years, providing conclusive evidence for the existence of a black hole.

"SAGITTARIUS A" SURPRISE

In the heart of the Milky Way galaxy, *NuSTAR* has spotted a mysterious glow of high-energy X-rays that, according to scientists, could be the "howls" of dead stars as they feed on stellar companions. The center of our Milky Way galaxy is bustling with young and old stars, smaller black holes and other varieties of stellar corpses -- all swarming around a supermassive black hole called **Sagittarius A***.

New images show a region around the supermassive black hole about 40 light-years across. Astronomers were surprised by the pictures, which reveal an unexpected haze of high-energy X-rays dominating the usual stellar activity. See: <http://www.nasa.gov/nustar>

NEW HORIZON IMAGES

For the first time, images from NASA's *New Horizons* spacecraft are revealing bright and dark regions on the surface of Pluto -- the primary target of the *New Horizons* close flyby in mid-July.

Also captured in the images is Pluto's largest moon, Charon, rotating in its 6.4-day long orbit. The exposure times used to create this image set -- a tenth of a second -- were too short for the camera to detect Pluto's four much smaller and fainter moons.

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

MESSENGER'S END.

The *Messenger* planetary exploration mission came to a planned, dramatic end on April 30th when it slammed into Mercury's surface at about 8,750 mph and created a new crater on the planet's surface. "Going out with a bang as it impacts the surface of Mercury, we are celebrating *Messenger* as more than a successful mission --- it will continue to provide scientists with a bonanza of new results and help unraveling the mysteries of Mercury," scientists said. See:

<https://www.youtube.com/watch?v=ENwD31EDFjc>

ANDROMEDA'S HALO

A team of scientists has identified an immense halo of gas surrounding the **Andromeda Galaxy**, the nearest major galaxy to Earth. The halo stretches about a million light-years from Andromeda, halfway to the Milky Way. The discovery will tell astronomers more about the evolution and structure of giant spiral galaxies such as the Milky Way and Andromeda.

The team drew five years' worth of data from the *Hubble* archive to conduct this research, and hope to amass a larger sample of quasars observed with *Hubble* to study in more detail the intimate relationship between the galaxy and its halo.

LOP-SIDED STAR EXPLOSION

NuSTAR has found evidence that a massive star exploded in a lopsided fashion, sending ejected material flying in one direction and the core of the star in the other. The findings offer the best proof yet that star explosions of this type, called **Type II** or **core-collapse supernovae**, are not symmetrical, a phenomenon that had been difficult to prove before now.

Apparently the process by which stars die causes their cores to be turbulent, boiling and sloshing around in the seconds before their demise. See:

<http://spacetelescope.org/images/potw1142a>

NEWBORN GLOBULAR CLUSTERS

Globular clusters - dazzling jumbo masses of up to a million ancient stars - are among the oldest objects in the universe. Though plentiful in and around many galaxies, newborn examples are rare but conditions necessary to create new ones have now been found.

Astronomers discovered what may be the first known example of a globular cluster about to be born: an incredibly massive, extremely dense, yet star-free cloud of molecular gas. They said: "To discover something that has all the characteristics of a globular cluster, yet has not begun making stars, is like finding a dinosaur egg that's about to hatch." See: <http://www.spxdaily.com/images-lg/alma-image-dense-cores-molecular-gas-in-antennae-galaxies-lg.jpg>

AKARI INFRARED DATA

The **AKARI space telescope's** far-infrared all-sky image data are now available. The new all-sky maps have four to five times better spatial resolution than conventional far-infrared all-sky images, and include data at longer wavelengths. Although having been launched more than 30 years ago, the IRAS all-sky maps are still a standard resource for astronomers. See:

<http://sci.esa.int/astrophysics/55873-akari-far-infrared-all-sky-data-released/>

A FORMING PLANETARY SYSTEM

A recent deep space image marks the first time we've seen a forming planetary system. A team found that circular gaps in a disk of dust and gas around the young star **HL Tau** are in fact made by forming planets.

The new study is the first to suggest the gaps are evidence of planetary formation because these planets avoid violent collisions with each other by having specific orbital periods where they miss each other, -- similar to how Pluto has avoided Neptune for billions of years despite the two orbits crossing one another. See:

<http://www.eurekalert.org/multimedia/pub/91312.php>

STRANGE PAIR

The Australian discovery of a strange giant exoplanet the size of Jupiter orbiting a small cool star is challenging ideas about how planets form. The host star, **HATS-6**, is classed as an M-dwarf, one of the most numerous types of stars in a galaxy. Although they are common, M-dwarf stars are not well understood because they are cool and dim, making them difficult to study.

MORE SPACE DEBRIS

Debris from the US Defense Meteorological Satellite Program (DMSP) F13 satellite, which recently exploded in orbit, could pose a threat to other spacecraft and missions according to new research from the University of Southampton. In February, the DMSP F13 satellite exploded in orbit producing over an estimated 100 pieces of space debris that were detected using radar.

TRAFFIC AROUND MARS GETS BUSY

NASA has beefed up a process of traffic monitoring, communication and maneuver planning to ensure that Mars orbiters do not approach each other too closely. Last year's addition of two new spacecraft orbiting Mars brought the census of active Mars orbiters to five.

X-FLARE

Sunspot AR2339 unleashed an intense X2-class solar flare on May 5th. Radiation from the flare caused strong radio blackouts on the Pacific side of Earth, interfering with communications at frequencies below ~20 MHz. The blast also hurled a CME into space, but not toward Earth. This event could herald a sustained period of high solar activity, as AR2339 appears to be large and explosive. Check <http://spaceweather.com> for more information and updates.

THE BRIGHT SPOTS ON CERES

The mysterious bright spots on the dwarf planet Ceres are better resolved in a new sequence of images taken by the *Dawn* spacecraft.

The brightest spots within a crater in the northern hemisphere are composed of many smaller spots. However, their exact nature remains unknown. Dawn scientists now conclude that the intense brightness of these spots is due to the reflection of sunlight by highly reflective surface material, possibly ice.

See: <http://www.jpl.nasa.gov/spaceimages/details.php?id=PIA19547>

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