THE YOUNG ASTRONOMERS NEWSLETTER

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September Equinox 9/22 — first day of Autumn

EXTREME SOLAR STORMS

If an asteroid big enough to knock modern civilization back to the 18th century appeared out of deep space and buzzed the Earth-Moon system, the near-miss would be instant worldwide "**Near Miss**".

Yet, just two years ago, Earth experienced a close shave just as perilous, but most newspapers didn't even mention it. The "villain" was an **extreme solar storm**, **the most powerful in as much as 150+ years**. "If it had hit, we would still be picking up the pieces," says Daniel Baker of the University of Colorado.

On July 23rd, 2012 a "Carrington-class" Solar Superstorm was observed --- and missed Earth in orbit. Information about these observations was first shared publicly by NASA on April 28, 2014. See:

http://en.wikipedia.org/wiki/Solar_storm_of_1859
http://www.space.com/14812-solar-flares-sun-storms-gallery.html

BLACK HOLE CLASSES

The universe has so many black holes that it's impossible to count them all and most are classed as big or colossal. Intermediate-mass black holes are so hard to measure that even their existence has been disputed. But now University of Maryland astronomers have accurately measured and confirmed a black hole about 400 times the mass of the Sun.

ERUPTIONS ON IO

Astronomers have viewed three massive volcanic eruptions on Jupiter's moon Io. This led them to speculate that such "outbursts," which can send material hundreds of miles above the surface, might be much more common than they thought.

Typically one huge outburst every one or two years is expected, and they're usually not this bright.

COMET'S IMAGE

A new *Rosetta* image of **comet 67P/Churyumov-Gerasimenko** shows a wide range of surface features. The head has parallel linear formations that resemble cliffs, the "neck" area displays scattered boulders, and the body has a terrain with peaks and valleys. See: **http://www.esa.int/spaceinimages/2014/08/Rosetta_s_comet_in_3D**

BIG HOLE IN RUSSIA

What's going on in Russia? Last year it was the "sky falling" with the Chelyabinsk meteor. Russians have discovered a mysterious hole in the middle of Siberia -- a crater stretching some 260 feet across. Officials have denied that a meteorite is to be blamed for the crater and a researcher said the giant hole was likely blown out by an explosion of gas trapped in the melting permafrost below.

ANTARCTICA BACTERIA FOUND

Scientists have confirmed the presence of an array of microorganisms, including an extensive family of rock-eating bacteria, living in a subglacial lake in Antarctica. The discovery gives hope to scientists who suggest life could still be lurking deep under the surface of Mars. Lake Whillans is buried under 2,640 feet of ice.

SUPER-SPEEDY ASTEROID

Researchers at the University of Tennessee studied near-Earth asteroid **1950 DA** which rotates so quickly it defies gravity but is held together by cohesive forces called **van der Waals**, --- never detected before on an asteroid.

Previous research has shown that asteroids are loose piles of rubble held together by gravity and friction but 1950 DA is spinning so quickly that it defies these forces --- it is rotating faster than the breakup limit for its density.

RARE DUST PARTICLES

Seven rare, microscopic interstellar dust particles that date to the beginnings of the solar system were collected from the Stardust spacecraft after its return to Earth in 2006.

The particles probably came from outside our solar system --- perhaps created in a supernova explosion millions of years ago and then altered over the years.. See: **http://www.nasa.gov/stardust**

EXOPLANETS

Barely 30 years ago, the Milky Way was full of stars similar to our own Sun but the count of known worlds in other star systems was zero.

Astronomers have not only found more than a thousand "exoplanets" circling distant suns, but are also beginning to make precise measurements of these far-away worlds.

HUNTING HIGH-MASS STARS WITH HERSCHEL

Scientists have discovered a continuous process in dense star-formation regions that tells the story of how massive stars are born. **W3** is a giant molecular cloud with an enormous stellar nursery in the ***Perseus Arm***, one of our Milky Way Galaxy's main spiral arms.

W3 is one of the largest star-formation complexes in the outer Milky Way with both low- and high-mass suns. The distinction is drawn at eight times the mass of our Sun — above this limit, stars end their lives as supernovae. See: **http://www.astronomy.com/-/media/Images/News%20and%20Observing/News/2013/03/W3_annotated.jpg?mw=600**

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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** *** * * ***

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ANOTHER TYPE OF SUPERNOVA - Some of the most powerful explosions in the universe just became a bit more varied. A type of exploding star first thought to be an unusual sort of **type Ia supernova** is actually a different class of supernova altogether. Explosions of these stars, dubbed **type Iax**, release somewhere between 1% and 50% the energy of a **type Ia supernova**, don't include any signs of hydrogen and there are hints that in many cases, a remnant of the star may survive the initial explosion.

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Puzzles

Find The Word

S	T	A	G	E	H	Y	A	T	T	ALIEN	IMAGE
S	T	H	S	T	A	Y	E	E	S	ARRAY	LOOSE
A	H	O	O	R	R	G	I	R	G	CASES	OUTER
L	L	A	R	E	A	A	A	A	A	CLASS	RISES
C	E	A	V	M	E	T	N	L	E	CLIFFS	RIVAL
L	O	E	I	E	S	E	L	G	N	CLOSE	SEVEN
I	O	U	T	E	R	L	A	E	E	COUNT	SHAVE
F	R	O	N	T	I	G	V	M	I	EARTH	STILL
F	I	R	S	T	E	E	I	N	L	EVERY	STORMS
S	C	A	S	E	S	I	R	T	A	GLARE	THREE

Scrambled Astronomy

MOONS

INTAT __ __ __ __ __

POREUA __ __ __ __ __ __

POBUHS __ __ __ __ __ __

MODISE __ __ __ __ __ __

CRONAH __ __ __ __ __ __

(Answers on page 4)

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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)*

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

Carina-Sagittarius spiral arm : **http://www.spxdaily.com/images-lg/star-cluster-ngc-3603-ngc-3576-lg.jpg**
LOFAR image: **http://www.spxdaily.com/images-lg/lofar-radio-map-whirlpool-galaxy-m51-lg.jpg**
12 billion-year-old cluster, IC4499 - **http://instagram.com/p/rlWrw1yXVa/**

SITE OF THE MONTH

Royal Observatory – Greenwich: **http://www.rmg.co.uk/royal-observatory**

* * * * * * MOON IN SEPTEMBER * * * * * *

First Quarter: 9/2 **Full Moon**: 9/9 **Last Quarter:** 9/17 **New Moon:** 9/24
Perigee: 9/7 10:30 PM 222,673 mi.. (358357 km) **Apogee**: 9/20 9:23 PM 252,180 mi. (405845 km)
****** The **September** Full Moon was called the **Corn Moon,** and the **Harvest Moon**.
**** Best observing nights:** 9/16 – 9/29

* * * * * * PLANETS IN SEPTEMBER * * * * * *

VENUS is in the eastern sky at dawn until the 23rd. After that date it will be moving behind the Sun and does not return until December. **JUPITER** rises in the eastern sky about 2 1/2 hours before sunrise. **MERCURY** is very low in the southwest and can be seen just before nightfall. **MARS** is low in the SW and sets less than three hours after sunset all month. **SATURN** is about 5° to the upper left of Mars in the SW and also sets about three hours after the Sun.

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

NAME	DATES	BEST NIGHT	PER HOUR	WHERE TO LOOK
AURIGIDS	8/24 – 9/4	9/1	6	Northeast.
PERSEIDS SPE	9/1 – 9/28	9/9	14	Northeast. The SPE stands for "September Perseids Epsilon". This is a branch of the main August Perseids and originates in the direction of the constellation Perseus. There are eight minor showers in September.

LOOK FOR: **>>>>>** **Saturn** and **Mars** in the SW, only 5+° apart on the 1st. **>>>>>** **Venus** 8° above **Regulus,** the brightest star in Leo, and very low in the SW on the 5th before sunrise. The name means "Little King" in Latin. **>>>>>** **Zodiacal Light** in the predawn sky during the last two weeks in September on clear moonless nights, and in the east before sunrise. **>>>>>** Red **Mars** just 3° above red, supergiant **Anatares**, the brightest star in Scorpius in the SW on 9/28. Its name is from the Greek and means "Rival of Mars".

EARTH-LIKE PLANET FOUND

A newly discovered planet in a binary star system (*two stars orbiting each other*) is expanding astronomers' theories of where Earth-like and potentially habitable-planets can form, and finding them. At twice the mass of Earth, the planet orbits one of the stars in the binary system at almost exactly the same distance from which Earth orbits the Sun.

However, because the planet's host star is much dimmer than the Sun, the planet is much colder than Earth. This is the first one close to Earth-like size that follows an Earth-like orbit, and its discovery within a binary system was by gravitational microlensing.

MERCURY

The origin of planet Mercury has been a difficult question in planetary science because its composition is very different from that of the other terrestrial planets and the Moon. According to a new study, Mercury and other unusually metal-rich objects in the solar system may be relics left behind by collisions in the early solar system that built the other planets.

One or more hit-and-run collisions could have potentially stripped away proto-Mercury's mantle without an intense shock, leaving behind a mostly-iron body. That would satisfy some of the major puzzles of planetary formation in a process that can also explain the absence of shock features in many of the mantle-stripped meteorites.

A COLONY ON VENUS?

US scientists and science-fiction writers alike have made a strong case for the possible colonization of Venus. While many space enthusiasts are keeping their eyes on Mars, there might be a planet with more prosperous opportunities for the human race. And there is a strong case for creating a floating colony above Venus.

HIGH ENERGY COSMIC RAYS

University of Utah observatory astronomers found a "hotspot" beneath the Big Dipper emitting a very unusual number of the highest-energy cosmic rays. The discovery moves physics another step closer to identifying the mysterious sources of the most energetic particles in the universe.

Another scientist suggests that the distribution of ultrahigh-energy cosmic rays in the northern sky is consistent with the "large-scale structure" of the universe, which means the cosmic rays tend to come from areas of the universe where matter is concentrated in clusters and superclusters of galaxies.

VOYAGER SPACE PROBES

Voyager 1 is the farthest human-made probe from Earth, and the first to enter the vast sea between stars. *Voyager 1* and its twin, *Voyager 2*, were launched in 1977. Both spacecraft flew by Jupiter and Saturn. *Voyager 2* also flew by Uranus and Neptune. *Voyager 2* is the longest continuously operated spacecraft and is expected to enter interstellar space in a few years.

OBSERVING WITH FIBER OPTICS

Optical-fiber bundles developed by researchers at the University of Sydney and the Australian Astronomical Observatory can sample the light from up to 60 parts of a galaxy in a dozen galaxies at a time. They call it “- the first 'Google street view' of the cosmos” - incredibly detailed views of huge numbers of galaxies.

By analyzing the light's spectrum astronomers can learn how gas and stars move within each galaxy, where the young stars are forming and where the old stars live. This will allow them to better understand how galaxies change over time and what drives that change.

NGC 3293

A striking new image of star cluster **NGC 3293** shows young stars huddled together against a backdrop of clouds of glowing gas and lanes of dust. Clusters like this are celestial laboratories that allow astronomers to learn more about how stars evolve.

It is in the constellation of **Carina** (The Keel) and was first spotted by the French astronomer Nicolas-Louis de Lacaille in 1751. During his stay in what is now South Africa, he used a tiny telescope with an aperture of just 12 millimeters!

See: **http://www.spxdaily.com/images-lg/young-star-cluster-ngc-3293-lg.jpg**

DWARF GALAXIES

The discovery that many small galaxies throughout the universe do not 'swarm' around larger ones like bees do but 'dance' in orderly disc-shaped orbits is a challenge to our understanding of how the universe formed and evolved.

For example, half of the dwarf galaxies surrounding the **Andromeda Galaxy** are orbiting in an immense plane that is more than a million light years in diameter, but is very thin, with a width of only 300 000 light years.

The universe contains billions of galaxies. Some, such as the Milky Way, are immense, containing hundreds of billions of stars. Most galaxies, however, are dwarfs, much smaller and with only a few billion stars.

The strange motion of dwarf galaxies suggests that these circular planes of dancing dwarfs are universal.

THE EARLY EARTH

Scientists say early Earth would have technically been inhabitable, but it wouldn't have been a very pleasant place to live. Researchers say little pockets of calmer life-sustaining water likely existed amid the boiling seas and giant magma fields.

But any organisms brave enough to carve out a niche on early Earth would have needed to endure extreme conditions, including an asteroid storm that peppered the planet for 500 million years.

Some asteroids were as small as a football field ---. But the big ones were 1,000 times the size of Manhattan.

MIS-ALIGNED DISKS

In a remarkable individual case, astronomers have uncovered a striking pair of wildly misaligned planet-forming disks in the young binary star system **HK Tau**.

These results provide the clearest picture ever of protoplanetary disks around a double star and could reveal important details about the birth and eventual orbit of planets in a multiple star system.

MAGNETIC FIELDS

Although Earth and Mercury are both rocky planets with iron cores, Mercury's interior differs from Earth's in a way that explains why the planet has such a bizarre magnetic field. Mercury's is approximately three times stronger at its northern hemisphere than its southern.

While Earth's is powerful, Jupiter's is more than 12 times stronger, and Mercury has a rather weak magnetic field. Venus likely has none at all. The magnetic fields of Earth, Jupiter and Saturn show very little difference between the planets' two hemispheres.

EXOPLANETS' WATER VAPOR

Hubble Space Telescope astronomers have been looking for water vapor in the atmospheres of three planets orbiting stars similar to the Sun -- and have come up nearly dry. The three planets were thought to be ideal candidates for detecting water vapor in their atmospheres because of their high temperatures where water turns into a measurable vapor.

They were found to have only 1/10 to 1/1000 the water predicted by standard planet-formation theories. A scientist said these results may have major implications in the search for water in potentially habitable Earth-sized exoplanets.

SOURCE OF GAMMA RAYS

Recent observations of several stellar eruptions (supernovas) confirmed that these relatively common outbursts usually produce gamma rays, the most energetic form of light. A nova is a sudden, short-lived brightening of an otherwise inconspicuous white dwarf caused by a thermonuclear explosion.

Each nova explosion releases up to 100,000 times the annual energy output of our Sun. Until now, no one suspected the outbursts were capable of producing high-energy gamma rays, emission with energy levels millions of times greater than visible light and usually associated with far more powerful cosmic blasts.

A "ZOMBIE" STAR?

Hubble astronomers spotted a star system just after an unusually weak supernova explosion. A supernova typically obliterates the exploding white dwarf or dying star but on this occasion, scientists believe it may have left behind a surviving portion of the dwarf star -- a sort of **zombie star**.

Astronomers have identified more than 30 of these mini-supernovas that may have left a surviving white dwarf "star". See: **http://www.nasa.gov/hubble** *and* **http://hubblesite.org/news/2014/32**

RED DWARF STARS

Red dwarfs are so common scientists wonder if they might be the best places to discover alien life. A new study concludes that nearly every one may have a planet located in its habitable zone where life has the best chance of existing,

Astronomers are discovering more and more planets around red dwarfs, and recent findings from the *Kepler space observatory* reveal that at least half of these stars host rocky planets that are one-half to four times the mass of Earth.

All in all, planets about the size of Earth seem plentiful in the universe, as do other worlds that are smaller than most gas giants, on the order of Neptune (which is 17 times the mass of Earth). Why such worlds are abundant is a mystery.

LOW-TEMPERATURE STAR

Astronomers have discovered an extremely cool object that is now as cool as a planet, but In the past it would have been as hot as a star for many millions of years. But its current temperature now is between that of the Earth and Venus.

However, the object shows evidence of a possible ancient origin, implying that a large change in temperature has taken place.

BLACK HOLE'S CORONA

The *NuSTAR* space observatory has captured an extreme and rare event in the regions immediately surrounding a supermassive black hole. A compact source of X-rays that sits near the black hole (corona), has moved closer to the black hole over a period of just days. The corona recently collapsed in toward the black hole, with the result that the black hole's intense gravity pulled all the light down onto its surrounding disk, where material is spiraling inward. See: **http://www.nasa.gov/nustar**

SUPERNOVA 2014J

Astronomers used a vast network of radio telescopes to obtain many images of supernova 2014J and confirming its lack of radio emissions.

A supernova is the giant explosion of a white dwarf star and this one, the closest to the Earth in decades, was discovered earlier this year. For decades there has been a dispute about how this happens but these new results rule out the vast majority of models that show the merger of two white dwarf stars is by far the most likely cause.

The explosion of a Type Ia supernova in the nearby Universe is a rare event and it's likely that more than a hundred years will pass until we see another such supernova so close to us. See: **http://scitechdaily.com/images/Voyager-Maps-Neptunes-Moon-Triton.jpg**

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