

YOUNG ASTRONOMERS NEWSLETTER

Volume 22 Number 4

STUDY + LEARN = POWER

March 2014

VERY STRANGE KEPLER-413b

Imagine living on a planet with seasons so erratic you would hardly know whether to wear Bermuda shorts or a heavy overcoat. That is the situation on **Kepler-413b**, a weird, wobbly world found by the planet-hunting *Kepler space telescope*. The planet wobbles, wildly on its spin axis, much like a child's top. Its axis can vary by as much as 30 degrees over 11 years leading to rapid and erratic changes in seasons. (In contrast, Earth varies 23.5 degrees over 26,000 years.)

ASTEROID PROTECTION

The United States and Russia will pool efforts in the creation of asteroid diversion techniques. Russian Emergency Situations Minister Vladimir Puchkov said in a video link with the administrator of the US Federal Emergency Management Agency (FEMA), that it was time to work together to protect the Earth from asteroids and meteorites.

STUDENT ROCKETRY PROGRAM

NASA'S student rocketry project has, for 12 years, challenged students to build rockets of their own design capable of flying 1 mile high. The latest competition is taking student-built vehicles more than 3 miles high, into the troposphere. Another new feature of this competition is the requirement that the teams build their vehicles with a parachute-based recovery system and provide three payloads capable of delivering data that could shape future NASA missions. See:

<http://www.nasa.gov/education/studentlaunch>

ZERO ROBOTICS COMPETITION

In this year's **Zero Robotics** tournament, secondary-school students from across Europe controlled miniature satellites in a competition to save our planet. The ultimate robot game challenged them to write math formulas that controlled experimental satellites.

With an imaginary comet approaching Earth, the satellites had to use gravitational attraction, laser repulsion or a combination of methods to change its path of planetary destruction.

The Space Station was turned into a playing field for the finals. See: <http://www.zerorobotics.org/web/zero-robotics/about>

OLDEST STAR

Australian astronomers found a star 13.6 billion years old, making it the most ancient star ever seen. Previous contenders for the title of oldest star are around 13.2 billion years old—two objects described by European and US teams respectively in 2007 and 2013.

The telltale sign that the star is so ancient is the complete absence of any detectable level of iron. See: <http://phys.org/news/2014-02-oldest-star-iron-fingerprint.html#jCp>

CRACKS ON DIONE

In a new *Cassini* image, crack-like features on **Dione's** surface appear wispy and faded but they are a series of geologically fresh fractures!

See: <http://www.spxdaily.com/images-lg/cassini-trailing-hemisphere-moon-dione-lg.jpg>

GALAXY CLUSTERS

Four unknown **galaxy clusters** each potentially containing thousands of individual galaxies have been discovered some 10 billion light years from Earth. An international team of astronomers used a new way of combining data from the two European Space Agency satellites, *Planck* and *Herschel*, to identify more distant galaxy clusters than has previously been possible.

The researchers believe up to 2000 further clusters could be identified using this technique, helping to build a more detailed timeline of how clusters are formed.

NEW GANYMEDE MAP

Scientists completed the first global geological map of **Ganymede**, Jupiter's largest moon and the largest in the solar system. With its varied terrain and possible underground ocean, **Ganymede** is considered a prime target in the search for habitable environments in the solar system, and the researchers hope this new map will aid in future exploration. See:

<http://www.spxdaily.com/images-lg/global-geological-map-ganymede-jupiter-moon-lg.jpg>

COSMOS "SOAP OPERA"?

Globular cluster **Terzan 7** is on the far side of the Milky Way. It is a peculiar cluster with evidence that shows it used to belong to the *Sagittarius Dwarf Galaxy*, a mini-galaxy discovered in 1994.

Terzan 7 is colliding with and being absorbed by the Milky Way - a monster in size when compared to this tiny one. And, it seems that it has already been kidnapped from its former home and now is part of our own galaxy. For more see: <http://www.nasa.gov/sites/default/files/potw1406a-hubble-terzan7.jpg>

STEPHAN'S QUINTET

The image of a clash among members of a famous galaxy, **Stephan's Quintet**, reveals an assortment of stars across a wide color range, from young, blue stars to aging, red stars. However, studies have shown that **NGC 7320** is a galaxy about seven times closer to Earth than the rest of the group. . See, and read at:

<http://www.kopernik.org/images/archive/n7317.htm>

BIG "BANG" IN ARGENTINA

The El Trebol Fire Brigade in Argentina reported a very loud high altitude explosion on February 18th and residents in the area said that the ground and buildings were shaking. The explosion's pressure waves generated vibrations on the surface, and window panes rattled as if it had been a minor earthquake.

GAS DIMMING BLACK HOLES

Astronomers are seeing huge clouds of gas orbiting supermassive black holes form clumps dense enough to intermittently dim the black holes' intense radiation. They found a dozen instances when X-ray signals dimmed for periods of time presumably when a cloud of dense gas passed between the source and satellite.

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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> ****

NASA is inviting the public to help astronomers discover undeveloped planetary systems hidden among data from the WISE mission through a new website, **DiskDetective.org**. Its primary goal is to produce publishable scientific results. From a perch in Earth orbit, the spacecraft completed two scans of the entire sky between 2010 and 2011. It took detailed measurements on more than 745 million objects, representing the most comprehensive survey of the sky at mid-infrared wavelengths currently available. (This is a "maybe" – take a look.)

Puzzles

Find The Word

C H I L D S W O H S	ACROSS	OCEAN
L L D L E I F F T K	CHILDS	PERCH
A E O E N T O I E S	CLASH	SCANS
S C M C S P T N N M	DENSE	SEEMS
H S R R E L L A E A	DIONE	SEVEN
A C I O E A C L V E	FIELD	SHAPE
P F R V S S N S E T	FINALS	SHOWS
E P E E R S E K S H	FIRST	SPRING
K L R S P R I N G O	KEPLER	TEAMS
H E R E L P E K E P	LEVEL	TITLE

Scrambled Astronomy

SATURN' S MOONS

OSETETL _ _ _ _ _
ADRAPON _ _ _ _ _
ODEIN _ _ _ _ _
STYHTE _ _ _ _ _
SAMMI _ _ _ _ _

(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 *****

"WISH" - HS female Juniors - <http://www.wish.aerospacescholars.org>

Beginning Astrophotography - <http://home.hiwaay.net/~krcool/Astro/asthwt0/TriAst.htm>

SITE OF THE MONTH

"Ten best astronomy and space sites" - <http://www.armaghplanet.com/blog/the-10-best-space-and-astronomy-sites.html>

***** MOON IN MARCH *****

New Moon: 3/1 First Quarter: 3/8 Full Moon: 3/16 Last Quarter: 3/24 New Moon: 3/30
Apogee: 3/11 2:47 PM 251,882 mi. (405365 km) Perigee: 3/27 1:31 PM 227,238 mi. (365705 km)

** The March Full Moon was called the **Magpie Moon**, **Crow Moon**, **Grass Moon**, and **Worm Moon**.

** **Best observing nights:** 3/1 – 3/18, 3/21 – 3/31

** **Daylight Savings Time** starts - 3/9 ** **First day of Spring** - 3/20

***** PLANETS IN MARCH *****

VENUS shines brightly in the SE morning sky. **MARS** rises 3 hours after sunset on the 8th and earlier each evening. In April, it will be closer to Earth than it has been for several years. Bright **JUPITER** is high above us in Gemini in the SE at sunset and is visible all night. **MERCURY** hangs low in the ESE morning sky all during March. **SATURN** will be opposite the Sun (*opposition*) on the 10th and rising in the E night sky around 11 PM. It is in the early SSW morning sky in Virgo.

***** 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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March has ten showers, all of which are minor - less than 5 per hour, or observed by radio. The earliest recorded shower occurred in i809 B.C. when "meteors fell like a shower" in China and the meteors were thought to be messengers from heaven. Indian tribes in California believed them to be "spirits of shamans who had died", the Ipais: "cannibal spirit looking for souls to eat", and to the Pomo tribes, they were "fire dropping from heaven".

LOOK FOR: >>>> **Jupiter's four moons** (with small and large telescopes) as they cast their shadows on Jupiter's cloud tops. >>>> **Cassiopeia**, the very bright, big W in the northwest sky with **The Pleiades** (Seven Sisters) cluster and **Hydra** high in the western sky. The Hydra's "V" of stars marks the face of **Taurus**, **the Bull**. The bright, orange star is Aldebaran, the bull's eye.

CURIOSITY DAMAGE

The *Curiosity* Mars rover vehicle has damaged one of its wheels against a sharp rock. It happened when the rover was going through dunes to Aeolis, the central peak of the Gale crater. Since another wheel was damaged in the autumn of 2013, scientists are trying to regularly photograph all its wheels. And, they have noticed that the rover's front left wheel has a puncture.

EXTREME BLACK HOLE

Astronomers have found one of the most powerful black holes known. The **RXJ1532** cluster's black hole in the *Corona Borealis* constellation has created enormous structures in the hot gas surrounding it and prevented trillions of stars from forming.

The large amount of hot gas near the center of the cluster presents a puzzle. Hot gas glowing with X-rays should cool, and the dense gas in the center of the cluster should cool the fastest. The pressure in this cool central gas is then expected to drop, causing gas further out to sink in towards the galaxy, forming trillions of stars along the way. However, astronomers had found no such evidence for this burst of stars forming at the center of this cluster.

Now, new X-ray Images of two large cavities in the hot gas on either side of the central galaxy may have provided an answer: the supersonic jets generated by the black hole have drilled into the hot gas and pushed it aside, forming the cavities.

Like sonic booms, shock front caused by the expanding cavities and the release of energy by sound waves reverberating through the hot gas provide a source of heat that prevents most of the gas from cooling and forming new stars.

BROWN DWARF'S WEATHER

A new video shows the first ever map of the weather on the surface of the nearest brown dwarf to Earth. An international team has made a chart of the features on one of two recently discovered brown dwarfs only six light-years from the Sun. Brown dwarfs fill the gap between giant gas planets, such as Jupiter and Saturn, and faint cool stars. They do not contain enough mass to initiate nuclear fusion in their cores and can only glow feebly at infrared wavelengths of light.

The first confirmed brown dwarf was only found twenty years ago and only a few hundred of these elusive objects are known. The atmospheres of brown dwarfs are very similar to those of hot gas giant exoplanets, so by studying comparatively easy-to-observe brown dwarfs astronomers can also learn more about the atmospheres of young, giant planets. See: <http://www.eso.org/public/archives/images/screen/eso1404a.jpg>

ROGUE ASTEROIDS

U.S. astronomers say that "*Rogue asteroids*", space rocks with compositions at odds with their position in the solar system, may be the norm, not the exception. Many scientists had long believed the solar system's asteroid population was essentially static -- those that formed near the Sun remained while those that formed farther out stayed on the outskirts. But in the last decade, the asteroid population seems to be just the opposite.

EARLY GALAXYS

Danish scientists say cosmic collisions created enormously massive galaxies already old and no longer forming new stars not long after the Big Bang. Astronomers have long been puzzled by the existence of such galaxies.

The first stars already emerged in the very early universe from the gases hydrogen and helium around 200 million years after the Big Bang. Astronomers say they believe the structure of the universe was built by baby galaxies gradually growing larger and more massive by constantly forming new stars and by colliding with neighboring galaxies to form new, larger galaxies. Then, the largest galaxies in today's universe have been under construction throughout the history of the universe.

SN 2014J

An exceptionally close stellar explosion discovered January 21st has become the focus of space and Earth observatories. The blast, designated **SN 2014J**, occurred in the galaxy **M82** and is the nearest optical supernova in two decades.

A *type Ia* supernova represents the total destruction of a white dwarf star by one of two possible scenarios. In one, the white dwarf orbits a normal star, pulls a stream of matter from it, and gains mass until it reaches a critical threshold and explodes. In the other, the blast arises when two white dwarfs in a binary system eventually spiral inward and collide.

A YOUNG STAR IN THE FORMING STAGE

A striking new *Hubble Space Telescope* image reveals a star in the process of forming within the **Chameleon** cloud. When new stars form, they gather material hungrily from the space around them and violently throw bursts of material out into space. This material is ejected as narrow jets that streak away into space at breakneck speeds of hundreds of miles/kilometers per second, colliding with nearby gas and dust and lighting up the region. See: <http://www.spacetelescope.org/images/potw1405a/>

GAIA BEING ACTIVATED

ESA's billion-star surveyor *Gaia* is slowly being brought into focus. Once *Gaia* starts making routine measurements, it will generate truly enormous amounts of data. To maximize the key science of the mission, only small 'cut-outs' centered on each of the stars it detects will be sent back to Earth for analysis. The test image shows a dense cluster of stars in the Large Magellanic Cloud in the Milky Way. See:

<http://www.theverge.com/2014/2/6/5387264/>

first-milky-way-image-from-gaia-star-surveyor TELESCOPES

Always remember, that as a general rule of thumb, the maximum amount of magnification for any telescope is 50-power per inch of aperture. The "aperture" is the front lens on a Refractor (straight through) telescope or the mirror in a Reflector type of scope. Pushing the scope's highest power eyepiece with a Barlow lens is similar to enlarging a photograph. But the negative — like a telescope's image — contains only so much detail which can be blown up only so far before all you can see is fuzz.

STEM AND CUBESATS

NASA has selected 16 small satellites designed and built by students in nine states to fly as auxiliary payloads aboard rockets planned to launch in 2015, 2016 and 2017. The proposed CubeSats come from universities, a primary school, non-profit organizations and NASA field centers. The primary school is St. Thomas More Cathedral School in Arlington, Virginia. Here is their submission:

"Build-Test-Launch Your STEM Initiative, What's Old is New Again through STEM. Teaching students today requires a STEM infused curriculum and a culture that is dynamic to produce the leaders of tomorrow. Teachers must challenge their students to lead their own learning experience through hands-on activities and collaborative learning, both real and virtual. Come see how a K - 8 school creatively applies a specific theme (CubeSat), uses available resources for teacher development, and integrates STEM into every-day curriculum and every level."

EARLY ELLIPTICAL GALAXYS

Astronomers have pieced together life-span details of **compact elliptical galaxies** that erupted and burned out early in the history of the universe. They are galaxies whose star formation was finished when the universe was only 3 billion years old, less than a quarter of its current estimated age of 13.8 billion years.

Through the research, astronomers have determined the **compact ellipticals** voraciously consumed the gas available for star formation, to the point they could not create new stars, and then merged with smaller galaxies to form giant ellipticals.

The stars in the burned-out galaxies were packed 10 to 100 times more densely than in equally massive elliptical galaxies seen in the nearby universe today, and that surprised astronomers.

ASTEROID THREAT

Space agencies from around the world are about to establish a high-level group to help coordinate global response should a threatening asteroid ever be found heading towards Earth. For the first time, national space agencies from North and South America, Europe, Asia and Africa will establish an expert group aimed at getting the world's space-faring nations on the 'same page' when it comes to reacting to asteroid threats. Of the more than 600 000 known asteroids in our Solar System, more than 10 000 are classified as near-Earth objects because their orbits bring them relatively close to our path.

EARLY UNIVERSE

A new Tel Aviv University study reveals that black holes formed from the first stars in the universe, heated the gas throughout space later than previously thought. They also left a clear signature in radio waves which astronomers can now search for.

Since the universe was filled with hydrogen atoms at that time, the most promising method for observing the epoch of the first stars is by measuring the emission of hydrogen using radio waves.

The new discovery overturns the common view and implies that these radio telescopes may also detect the tell-tale signs of heating by the earliest black holes.

CHINA'S YUTU

Troubles plague China's *Yutu* (Jade Rabbit) moon rover as solar panels failed to fold back properly when the rover was preparing to shut down for its second lunar dormancy period. Since daylight has returned to its landing site, the *Yutu Moon rover* seems to be damaged beyond any practical use. It will take China some time to diagnose *Yutu's* faults and work out a strategy to use it.

TRIFID NEBULA

A storm of stars is brewing in the **Trifid nebula** - a stellar nursery, where baby stars are bursting into being, Yellow bars in the nebula appear to cut a cavity into three sections, hence the name **Trifid nebula**.

Radiation and winds from massive stars have blown a cavity into the surrounding dust and gas, and presumably triggered the birth of new star generations. See: http://www.nasa.gov/sites/default/files/pia17834_1.jpg

A RED "BROWN DWARF"

A peculiar example of a brown dwarf but with unusually red skies has been discovered by a team of astronomers. The brown dwarf caught the researchers' attention because of its extremely red appearance compared to "normal" brown dwarfs.

Further observations have shown that the reason for its peculiarity is the presence of a very thick layer of clouds in its upper atmosphere, - clouds that are mostly made of mineral dust, like corundum and enstatite - a type of magnesium silicate.

NEW SCAR ON MARS

Space rocks hitting Mars excavate fresh craters at a pace of more than 200 per year, but few Mars scars pack as much visual punch as one seen in a new NASA image from the *Mars Reconnaissance Orbiter*.

See: <http://www.jpl.nasa.gov/spaceimages/details.php?id=PIA17932>

CHANDRA

NEW OBSERVATION - When the *Chandra X-ray Observatory* began operations in 1999, it was pointed at **Centaurus A's** gargantuan jet blasting away from a central supermassive black hole.

Since then, Chandra has gathered more data that has provided astronomers with a view of a spectacular jet of out-flowing material generated by the black hole and a dust lane that wraps around the waist of the galaxy. See: http://www.nasa.gov/mission_pages/chandra/multimedia/centaurus-2014.html#.UwEoGz1dUqM

SUPER-FAST PULSAR - Chandra also discovered a fast-moving pulsar escaping from a supernova remnant and spewing out a record-breaking jet of high-energy particles - the longest of any object in the Milky Way galaxy.

The pulsar is a type of neutron star, and its peculiar behavior can likely be traced back to its birth in the collapse and subsequent explosion of a massive star. Its implied speed is between 2.5 million and 5 million mph, making it one of the fastest pulsars ever observed. It is located in the constellation of **Carina**.

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