YOUNG ASTRONOMERS NEWSLETTER

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COMET ISON IS COMING

Comet Ison may draw millions to witness what could be the brightest comet seen in many generations – brighter even than the full Moon.

At the moment it is visible only in sophisticated telescopes – a point of light moving slowly against a background of stars - a frozen chunk of rock and ice that is being tracked with eager anticipation by astronomers from around the world, and soon everyone could know its name.

By the end of summer it will become visible in small telescopes and binoculars. By October it will pass close to Mars and things will begin to stir.

The surface will shift as the ice responds to the thermal shock, cracks will appear in the crust, and tiny puffs of gas will rise from it as it is warmed. The comet's tail is forming. Slowly at first but with increasing vigor, as it passes the orbit of Earth, the gas and dust geysers will gather force. The space around the comet becomes brilliant as the ice below the surface turns into gas and erupts, reflecting the light of the Sun.

Now Ison is surrounded by a cloud of gas called the coma, hundreds of thousands of miles from side to side. The comet's rotation curves these jets into space as they trail into spirals behind it. As they move out the gas trails are stopped and blown backwards by the Solar Wind.

Ison will be a sight never forgotten.

OBSERVATORY FIRE

Telescopes at Australia's Siding Spring Observatory appear to have survived a devastating bushfire that destroyed nearby homes and damaged several buildings on the site. The fire with hot, strong winds, damaged parts of the astronomy research hub located about 330 miles northwest of Sydney.

Eighteen staff working at the observatory, which houses 10 telescopes run by Australian, Polish, British, South Korean and American researchers, were safely evacuated before the fire struck.

2012 DA14

A near-Earth asteroid - **2012 DA14,** will pass very close to Earth on February 15th. At its closest, it will be within the orbit of the Moon (about 240,000 miles away), and within the orbits of all those geo-synchronous satellites and the space debris (about 26,000 miles up).

2012 DA14 will pass 21,000 miles from Earth. Every scientist alive (*and maybe the rest of us*) will be watching this one.

EXOMOONS

In their search for habitable worlds, astronomers have started to consider **exomoons -** those likely orbiting planets outside the solar system. In a new study, researchers found that **exomoons** are just as likely to support life as exoplanets.

About 859 extrasolar planets are known, and most of them are sterile gas giants, similar to Jupiter. Only a few have a solid surface and orbit their host stars in the habitable zone, the right distance to potentially allow liquid surface water and a mild environment.

LUPUS 3

A new image from ESO shows a dark cloud, **Lupus 3**, where new stars are forming along with a cluster of brilliant stars that have already emerged from their dusty stellar nursery. It is the best image ever taken in visible light of this little-known object. On the left, there is a dark column resembling a cloud of smoke. To the right shines a small group of brilliant stars.

The cloud contains huge amounts of cool cosmic dust and is a nursery where new stars are being born. It is likely that the Sun formed in a similar star formation region more than four billion years ago. See:

http://www.eso.org/public/images/eso1303a/

VERY ACTIVE SUNSPOT

On January 11th, one of the biggest sunspots of the 11-year solar cycle rotated around to point toward Earth. The whole region crackled with medium-sized (M-class) flares and broke the recent spell of calm space weather around our planet. On the 13th, the Sun erupted with an Earth-directed coronal mass ejection (a CME) - a solar phenomenon that can send solar particles into space and reach Earth one to three days later.

For images, updates, see: **http://spaceweather.com** Solar flare alerts: X-flare alerts are available at: **http://spaceweathertext.com**

ISS SCIENCE CHALLENGE

Middle school students from Iowa and New York schools are the two winners of the International Space Station Science Challenge. They reviewed science experiments on the International Space Station and developed a project to teach others about their investigation. Projects included the development and creation of a Web page, a slide presentation, an audio or video podcast or a written report. See:

http://go.nasa.gov/13MilTb

MARTIAN CRATER WATER

The *Mars Reconnaissance Orbiter* is providing new evidence of clay and carbonates at the bottom of a Martian crater which apparently allowed underground water to flow into the crater's interior. Scientists said that the observations provide the best evidence for carbonate forming within a lake environment instead of being washed into a crater from outside.

The Sky Tonight? **http://www.skymaps.com/downloads.html** *and also*
http://amazing-space.stsci.edu/tonights_sky/
http://hubblesite.org/explore_astronomy/tonights_sky/
StarDome at http://astronomy.com
******** ***Astronomy Picture of The Day*** - **http://apod.nasa.gov/apod/astropix.html** ********

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SCIWORKS – For information and planetarium schedules call 767-6730

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Puzzles

Find The Word

H C T A W O R L D S
C O M E T I T A N H
R U S H G E N I P S
A H E H B N A D H I
M S T A W R I C S T
E I L O G E A G H I
V F L A R E E E E R
I B M E R B R C L B
L M H E S N I N E C
A W R E C E N T E R

ALIVE
BEGIN
BLOWN
BRITISH
CLEAR
COMET
EAGER
FLARE
GAMMA
GRAINS
MARCH
MILES
ORBIT
RIGHT
TEACH
THESE
WATCH
WHERE
WINDS
WORLDS

Scrambled Astronomy:

MEN

PRUESES __ __ __ __ __ __ __

MIGINE __ __ __ __ __ __

RGAAUI __ __ __ __ __ __

STOBEO __ __ __ __ __ __

SIDUN __ __ __ __ __

(Answers below4)

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The YOUNG ASTRONOMERS NEWSLETTER is on the internet at the FAS website -
http://www.fas37.org *and at:* **http://www.summitschool.com/pwood/sfair/yan.html**

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

- Gamma Ray Bursts - **http://www.nasa.gov/mission_pages/chandra/multimedia/abell_2052.html**
- Jumble of exotic stars - **http://www.eso.org/public/news/eso1302/**

SITE OF THE MONTH

Earth Sky Organization -**http://earthsky.org/earthsky-a-clear-voice-for-science**

******** FEBRUARY MOON ********

Perigee: 2/7 7:10 AM 226,995 mi. (365313 km) **Apogee:** 2/19 1:31 AM 251,328 mi. (404473 km)

- The Full Moon was called The Snow Moon and The Hunger Moon – a lean month of food for man and beast.
- **Best viewing nights:** 2/3 – 2/17

******** PLANETS IN FEBRUARY ********

MARS and **MERCURY** are near each other in the west-southwest evening twilight all month. They are only .4º apart on the 8th and are difficult to spot. On the 16th, Mercury is at its best evening viewing for 2013 and then fades rapidly. **JUPITER** is high in the southeastern evening sky. It begins moving eastward late in the month. **VENUS** – maybe catch a last glimpse early this month, very low in the east-southeast. Then it's gone until May. **SATURN** is visible in the south before dawn on the 1st, earlier each night, and after the 19th begins its march towards peak visibility in late April. **URANUS** is among the stars of Piscis in the southern sky setting by 10 PM, and then by 8 PM at month's end. **NEPTUNE** is behind the Sun on the 20th (*superior conjunction).*

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

NAME	DATES	BEST NIGHT	PER HOUR	WHERE TO LOOK

There is some meteor activity in the sky every night. Most of this activity is from sporadic meteors, or meteors not particularly associated with any known meteor stream; however, some do belong to minor meteor showers – all with less than 5 per hour. And watch for an occasional fireball.

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LOOK FOR: >>>>> Saturn's moon Titan (with a telescope) – it is to the north of Saturn on the 9th and 25th, and south on the 16th. **>>>>> Zodiacal Light –** in early evenings from the 28th through March 12 just after evening twilight in the west. It appears as a faint cone of light coming up from the horizon and is caused by interplanetary dust grains reflecting sunlight.

EXO-COMETS

Comets trailing wispy tails across the night sky are a beautiful byproduct of our solar system's formation, icy leftovers from when the planets were produced from rocky rubble. Astronomers' discovery of six likely comets around distant stars suggests that "*exocomets*" are just as common in other stellar systems with planets. The ten stars that were observed have massive disks of gas and dust making it highly likely they all have exoplanets.

HUNTING FOR HABITABLE PLANETS

Volunteers from the Planethunters.org website, part of the Oxford University-led **Zooniverse** project, have discovered 15 new planet candidates orbiting in the habitable zones of other stars. Within the zone, atmospheric temperatures range from -126 to +86 degrees Fahrenheit.

Added to the 19 similar planets already discovered in habitable zones where the temperature is neither too hot nor too cold for liquid water, there may be a "traffic jam" of strange worlds that could potentially support life.

(Planet Hunters enlists volunteers to help professional astronomers detect planets outside Earth's solar system by sifting massive amounts of data gathered by NASA's Kepler spacecraft.)

The scientists say a rocky planet there with a greenhouse atmosphere could have pools of liquid water, and thus the possibility of life. The discovery of the new candidate planets nearly doubles the number of gas giant planet candidates known to be orbiting within the habitable zones of solar stars.

Kepler finds exoplanets by watching for worlds that move directly between the telescope and their host stars and block a tiny fraction of the star's light - a "transit. One of the most common false alarms is caused by what are called "eclipsing binaries" - two stars that orbit and pass in front of each other. If one of the stars is smaller and dimmer than the other,

it can create a light curve that looks a lot like a planet and Kepler can't tell the difference between the light of the two. A Jupiter-size planet would block only one percent of its light but an Earth-size planet would block much less.

CYGNUS LOOP IMAGE

The *National Optical Astronomy Observatory* has a new wide-field image of the ***Cygnus Loop***. The image covers an area of the sky about 45 times that of the Full Moon without sacrificing high resolution, and is one of the largest astronomical images ever made. See:

http://www.noao.edu/image_gallery/html/im1138.html

UNEXPECTED OUTBURST

The surprising discovery of a massive outburst in a neighboring galaxy (ten times brighter than the largest supernova, or exploding star) is giving astronomers a tantalizing look at what likely is a powerful “belch” by a gorging black hole at the galaxy's center. The scientists were conducting a long-term study of molecules in galaxies, when one of the galaxies showed a dramatic change.

The discovery was entirely accidental. Observations spread over a few years showed that the one galaxy had changed from being benign and quiet to undergoing a huge energetic outburst.

SISTER PLANETS ?

The Milky Way contains at least 17 billion planets the size of Earth, and likely many more, according to a study that raises the chances of discovering a sister planet to ours. Astronomers using NASA's *Kepler* spacecraft found that about 17 percent of stars in our galaxy have a planet about the size of Earth in a close orbit. The Milky Way is known to host about 100 billion stars, meaning that about one of every six has an Earth-sized planet around it.

The finding does not mean that all those planets beyond our solar system, or exoplanets, could be habitable though it increases the chances of finding planets similar to Earth.

GROWTH OF YOUNG STARS

Astronomers have their first glimpse of a fascinating stage of star formation in which planets forming around a young star are helping the star itself continue to grow. As young stars gather material from their surrounding clouds of gas and dust, the incoming material forms a flat, spinning disk around the star. Planets begin as small clumps and as the planets pull in more material, they also leave a gap in the disk.

The gap is not empty, but is filled by streamers of thin and dense gases bringing material from the outer portion of the disk, near and onto the planets, and into the disk's inner portion.

FOMALHAUT

New *Hubble Space Telescope* images of a vast debris disk encircling the nearby star Fomalhaut and a strange planet circling it may provide forensic evidence of a titanic planetary disruption in the system.

Astronomers are surprised to find the debris belt is wider than previously known, spanning a section of space from 14 to nearly 20 billion miles from the star. Even more surprisingly, the planet follows an unusual elliptical, 2000-year orbit that carries it on a potentially destructive path through the vast dust ring. See:

http://www.nasa.gov/hubble and also
http://hubblesite.org/news/2013/01

MILKY WAY'S BLACK HOLE

Researchers have new images of a ring of gas and dust seven light-years in diameter surrounding the supermassive black hole at the center of the Milky Way, and a neighboring cluster of extremely luminous young stars embedded in dust cocoons.

The black hole is 4 million times the mass of the Sun and is orbited by a large disk of gas and dust – a galactic center that also hosts several exceptionally large star clusters containing some of the most luminous young stars in the galaxy, one of which is the ***Quintuplet Cluster***. See: **http://www.nasa.gov/sofia**

VELA PULSAR

A movie from NASA's *Chandra X-ray Observatory* features a deeper look at a fast moving jet of particles produced by a rapidly rotating neutron star, and may provide new insight into the nature of some of the densest matter in the universe.

The **Vela pulsar** is a neutron star that was formed when a massive star collapsed. It is about 12 miles in diameter and makes a complete rotation in 89 milliseconds. See: **http://chandra.si.edu**

NGC 5477

Ursa Major (The Great Bear) is home to Messier 101, the Pinwheel Galaxy - one of the biggest and brightest spiral galaxies in the night sky. **NGC 5477**, is a dwarf galaxy in the Messier 101 group with visible signs of ongoing star birth. See: **http://www,nasa.gov/images/content/718568main_potw1301a.jpg**

RADIO WAVE PICTURES

Stars in the early and late phases of their evolution are shrouded by huge dusty envelopes in the form of dust and gas outflows. Astronomer Farhad Zadeh has discovered a new tool for detecting these dusty clouds and stars: a ***radio wave picture***, and identifies them as ***radio dark clouds and stars***.

Unlike in the optical, X-ray and infrared wavelengths, it is unusual to see a dark feature with radio waves. Radio is a long wavelength and therefore doesn't get absorbed easily and typically passes through whatever is in its way.

SPHERES IN SPACE

On January 18th, a squadron of mini satellites on the International Space Station began to obey remote commands from students across Europe. The teams competed in a space game called **RetroSpheres**. The students had run their code in a virtual world, but high-school finals used the real thing: robotic droids on the International Space Station.

But operating droids in space was no obstacle for a German-Italian alliance to reach the finish line of the Zero Robotics tournament.

This year's **RetroSpheres** scenario involved the **Spheres** using jets of compressed gas to push simulated space debris out of orbit. Finalists saw their computer code operate robots in space for the first time.

MILKY WAY REGIONS FOUND

Astronomers have discovered hundreds of previously-unknown sites of massive star formation in the Milky Way, including the most distant such object NGC 5477 that looks much like a typical dwarf irregular galaxy. The bright nebulae that extend across much of the galaxy are clouds of glowing hydrogen gas in which new stars are forming.

These glow pinkish red in real life, although the selection of green and infrared filters through which this image was taken makes them appear almost white.

SUPERNOVA WITH A HISTORY

Astronomers announced that massive star ***SN 2009ip*** in NGC 7259 which had repeatedly imitated “a supernova” since 2009, finally exploded “for real”. Such objects are known as **luminous blue variables** (LBVs) that emit about 1 million times as much energy as the Sun, contain 50-80 Sun's worth of mass, and vary wildly in brightness.

They nearly exhaust their hydrogen fuel, and for reasons which are poorly understood, undergo brief recurrent episodes of explosive mass loss.

Soon after the star's 2009 discovery in **Piscis Austrinus**, the outburst was recognized as one in which the star survived and also one that had been detected in multiple images of NGC 7259.

The result is of special interest because it provides new critical information on the final death throes of massive stars in the years leading up to their explosion.

MILKY WAY SKELETON

The Milky Way, is a pinwheel-shaped collection of stars, gas and dust with a central bar and two major spiral arms that wrap around its disk. Since we view the Milky Way from the inside, its exact structure is difficult to determine. But now astronomers have identified a new structure in the Milky Way: a long tendril of dust and gas like a "**bone in a skeleton**." Other spiral galaxies also display internal bones or endoskeletons.

Observations have found long skinny features jutting between galaxies' spiral arms. These relatively straight structures are much less massive than the curving spiral arms. The structure in the Milky Way is more than 300 light-years long but only 1 or 2 light-years wide. It contains about 100,000 Suns' worth of material, and now looks more like a cosmic snake.

STRANGE CLOUD

A curiously dense cloud has baffled astronomers at Caltech. It is near our galactic center where billowing clouds of gas and dust cloak a supermassive black hole three million times as massive as the Sun - a black hole whose gravity is strong enough to grip stars that are whipping around it at thousands of miles per second.

The 30 light-years-long cloud appears as a bean-shaped silhouette against a bright backdrop of dust and gas glowing in infrared light. The cloud's darkness means it is dense enough to block light.

According to conventional wisdom, clouds of gas that are this dense should clump up to create pockets of even denser material that collapse due to their own gravity and eventually form stars. But only a few stars are being born there-and even then, they are small.

The Caltech astronomers say that its star-formation rate is 45 times lower than what astronomers might expect and add: ” - which is very weird.” See:

http://earthsky.org/science-wire/a-cloudy-mystery

ASTEROID DEFLECTION SYSTEMS

The European Space Agency (ESA) is asking for research ideas to help guide the development of a US-European asteroid deflection mission. Concepts are needed for both ground- and space-based investigations.

Also, improvements in the understanding of the physics of very high-speed collisions involving both man-made and natural objects in space are an essential part of the program.

AIDA: is an ESA double mission to a double asteroid..This innovative, low-budget transatlantic partnership involves the joint operations of two small spacecraft sent to intercept a binary asteroid.

The first Double Asteroid Redirection Test (DART) spacecraft, designed by the US Johns Hopkins Applied Physics Laboratory will collide with the smaller of the two asteroids. ESA's Asteroid Impact Monitor (AIM) craft will survey these bodies in detail, before and after the collision.

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Scrambled Astronomy Answers:
SUDNI ,SETOOB ,AGIRUA ,INIMEG ,SUESREP