

# THE YOUNG ASTRONOMERS NEWSLETTER

Volume 21 Number 8

**STUDY + LEARN = POWER**

July 2013

## MARS

### - MARS STREAMBED

Rock samples found by the *Curiosity* rover have been identified as part of an ancient Martian streambed. The rocks are the first ever found on Mars that contain streambed gravels.

The sizes and shapes of the gravels embedded in these conglomerate rocks - from the size of sand particles to the size of golf balls - enabled researchers to calculate the depth and speed of the water that once flowed at this location.

### - OPPORTUNITY DISCOVERY

Scientists called NASA's *Opportunity* rover gimpy and arthritic, but hailed its new discoveries about early water on Mars made almost 10 years after it was launched.

The unmanned solar-powered vehicle has just analyzed what may be its oldest rock ever, known as **Esperance 6**. It contains evidence that potentially life-supporting water once flowed in abundance, leaving clay minerals behind.

### EARLY METEORITE JEWELRY

English researchers have found conclusive proof that Ancient Egyptians used meteorites to make symbolic accessories. The evidence comes from iron beads excavated in 1911 at the Gerzeh cemetery, a burial site approximately 40 miles south of Cairo.

Dating from 3350 to 3600 BC, thousands of years before Egypt's Iron Age, the bead was originally assumed to be from a meteorite owing to its composition of nickel-rich iron. However, electron microscope and X-Ray CT scanner examinations have confirmed the bead's meteorite origins.

### HERSCHEL BOWS OUT

The Herschel deep-space telescope took its final bow on 6/17, climaxing a successful four-year mission to observe the birth of stars and galaxies. The largest and most powerful infrared telescope in space, Herschel made over 35,000 scientific observations and amassed more than 25,000 hours of science data. The satellite has now been placed in a safe, "disposal" orbit around the Sun.

### SMALLEST GALAXY

With 1,000 or so stars, the least massive galaxy in the known universe has been measured by scientists at UC Irvine. The size and weight of **Segue 2**, are its most extraordinary aspects. Astronomers have been searching for years for this type of dwarf galaxy, long predicted to be swarming around the Milky Way.

### A CME

Severe space "weather" can knock out satellite communications and GPS systems, expose space tourists and astronauts to dangerous levels of radiation, and even cause massive blackouts on Earth that could last up to two years.

A Sun storm (a Coronal Mass Ejection –CME) on the scale of one that happened in 1859 would potentially have widespread consequences on huge population clusters worldwide.

## TRIFID NEBULA

The **Trifid of the North** is a large, dusty region that is currently forming new stars. These stars are blue and very hot. Unlike the venomous fictional plants, *Trifid of the North*, **NGC 1579** poses no threat to our vision. The **Trifid Nebula** (MS20) lies much further south and displays strikingly similar swirling clouds of gas and dust, still forming new stars. See: <http://hubblesite.org/gallery/album/pr2004017g/npp/all/>

### PULSATING STARS

An unusual stellar cluster has prompted astronomers to create a new class of stars: stars with "pulsating" brightness. Astronomers have long known about variable, or "pulsating," stars but the stars in **NGC 3766** do not fit into any known category. They are somewhat hotter and brighter than the Sun, but otherwise seem run-of-the-mill. Sky-watchers made the discovery over seven years of patient measurements of 3,000 stars in cluster **NGC 3766** in the constellation of **Centaurus**.

### THE NGTS

Since its launch in 2009, the *Kepler Space Telescope* has found thousands of potential planets around other stars by watching for the dips in starlight as planets pass over (transit) the disc of their stars. Some are gas giants like Jupiter, but many are so close to their stars that their atmospheres sizzle. And some are so faint that we cannot measure their mass.

But now, the *Next-Generation Transit Survey* (NGTS) is being built at the European Southern Observatory in Chile's Atacama Desert. It will also be the perfect counterpoint to the space-based *Kepler*.

### NASA/LEGO "DESIGN AND BUILD CONTEST"

NASA and the LEGO Group are offering a new design competition that will challenge students of all ages to use the toy bricks in building models of future airplanes and spacecraft. For rules and guidelines see:

<http://rebrick.lego.com/>

### FURTHEST EXOPLANET

*Hubble* astronomers have evidence of a planet forming 7.5 billion miles away from its star, a finding that may challenge current theories about planet formation.

Of the almost 900 planets outside our solar system, this is the first to be found at such a great distance from its star. It is orbiting the red dwarf **TW Hydrae** in the constellation **Hydra** the Sea Serpent.

### ARIANE SPACE FREIGHTER

An **Ariane** rocket, the size of a double-decker bus, blasted off from French Guiana on June 6th carrying a record 6.6 tons of food, water, oxygen, science experiments and special treats for the International Space Station. At nearly 20.2 tons, the European space freighter, named after Albert Einstein, is the heaviest spacecraft ever launched by an **Ariane** rocket. It automatically docked with the ISS on June 16th

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*The Sky Tonight?* <http://www.skymaps.com/downloads.html> and also  
[http://amazing-space.stsci.edu/tonights\\_sky/](http://amazing-space.stsci.edu/tonights_sky/)

\*\*\* *Astronomy Picture of The Day* - <http://apod.nasa.gov/apod/astropix.html> \*\*\*

**MUSIC OF THE STARS** - Plato, the Greek philosopher and mathematician, described music and astronomy as "sister sciences" that both encompass harmonious motions, whether of instrument strings or celestial objects. Gerhard Sonnert, a research associate at the Harvard-Smithsonian Center for Astrophysics, has published a new website that allows listeners to literally hear the music of the stars. He worked with Wanda Diaz-Merced, a postdoctoral student at the University of Glasgow whose blindness led her into the field of **sonification** (turning astrophysical data into sound); and with composer Volkmar Studtucker, who turned the sound into music.

## PUZZLES

### FIND THE WORD

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

AREAS  
 BALLS  
 BEADS  
 CAIRO  
 CROSS  
 DELTA  
 DENEK  
 DEPTH  
 DWARF  
 EARLY

FAINT  
 GIANT  
 HOURS  
 HYDRA  
 PROOF  
 SEGUE  
 SOLAR  
 SOUND  
 THEIR  
 TREATS

### SCRAMBLED ASTRONOMY

#### SUMMER SKY

SOBOET \_ \_ \_ \_ \_  
 SUNGCY \_ \_ \_ \_ \_  
 RODAC \_ \_ \_ \_ \_  
 GIROV \_ \_ \_ \_ \_  
 SUPUL \_ \_ \_ \_ \_

*(Answers below)*

### \*\*\*\*\* INTERNET SITES \*\*\*\*\*

Starburst galaxy - <http://scitechdaily.com/ngc-6334-experiencing-a-mini-starburst/>  
 Best U/V "Cloud" maps - [http://www.nasa.gov/mission\\_pages/swift/bursts/magellanic-uv.html](http://www.nasa.gov/mission_pages/swift/bursts/magellanic-uv.html)  
 American Meteor Society - <http://www.amsmeteors.org/>  
 The Tadpole Nebula - <http://www.rc-astro.com/photo/id1159.html>

### SITE OF THE MONTH

*Hubble's wallpaper site* - <http://hubblesite.org/gallery/wallpaper/>

### \*\*\*\*\* JULY MOON \*\*\*\*\*

**New Moon:** 7/8    **First Quarter:** 7/15    **Full Moon:** 7/22    **Last Quarter:** 7/29  
**Apogee:** 7/6 8:35 PM 252,581 mi. (406490 km)    **Perigee:** 7/21 3:12 AM 222,700 mi. (358401 km)  
 \*\* The **July Full Moon** is the **Hay, Buck,** and the **Thunder Moon.** \*\* **Best observing nights:** 7/1 – 7/15

### \*\*\*\*\* PLANETS IN JULY \*\*\*\*\*

VENUS stays very low in the western sky as the Sun sets. It is shining very brightly as it moves towards the south each night. JUPITER is very low in the northeast before sunrise and is 1° above Mars on the 22nd. MERCURY returns on the 25th very low in the northeast 3/4 hour before sunrise. It is just below Mars. SATURN is in the southwest sky after sunset and sets around 10 PM. MARS stays very low in the northeast before sunrise and is hard to follow. URANUS is high in the southeast after midnight – the faint blue-green planet is best seen with a telescope, or binoculars in a dark area.

### \*\*\*\*\* METEOR SHOWERS \*\*\*\*\*

NAME	DATES	BEST NIGHT	PER HOUR	WHERE TO LOOK
<b>DELTA AQUARIDS</b>	7/18 – 8/18	7/28 – 7/29	20	In the east after midnight. This shower is one of a series of showers coming from the Aquarius and Capricorn constellation areas during July and August. They have provided a great deal of confusion and many varying observations by experienced observers using radio-echos, radar, photographic and visual observations since 1870. July has five other showers.

**LOOK FOR:** >>>> **MARS** and **JUPITER** passing less than 5° apart from 7/11 to the end of July - only 0.8° on the 7/22. >>>> The "Northern Cross", **CYGNUS**, is flying down the Milky Way just northeast of bright **Vega**. >>>> The Swan's brightest star **DENEK**, at the top of the "Cross", is about 50,000 times as bright as our Sun. >>>> Reddish **ANTARES** after sunset in the south. It is a bloated red supergiant in **SCORPIUS** - the brightest constellation in the sky.

## A BLACK HOLE'S GRAVITY

A composite image of a galaxy **4C+29.30** illustrates how the intense gravity of a supermassive black hole can be tapped to generate immense power. The image contains X-ray data, optical light, and radio waves. Two jets of particles are speeding at millions of miles per hour away from a supermassive black hole at the center of the galaxy. The estimated mass of the black hole is about 100 million times the mass of our Sun. See:

<http://www.chandra.harvard.edu/photo/2013/4c2930/>  
**"FAST" GALAXY**

Two hungry young galaxies that collided 11 billion years ago are rapidly forming a massive galaxy about 10 times the size of the Milky Way. The new mega-galaxy, dubbed **HXMM 01**, is "the brightest, most luminous, and "most gas-rich galaxy merger known" as viewed in submillimeter wavelengths - (between *infrared* and *microwave*),

Capturing the creation of this type of large, short-lived star body is extremely rare: "- the equivalent of discovering a missing link between winged dinosaurs and early birds," said scientists. See: <http://www.nature.com/nature/journal/vaop/ncurrent/full/nature12184.html>

## EXTREME MICROBES

Scientists say they've found bacteria growing in the Canadian arctic at temperatures nearly as cold as the surface of Mars – about 5 degrees Fahrenheit, -- the coldest temperature ever reported for bacterial growth.

"The microbe may tell us a lot about how similar microbial life may exist elsewhere in the solar system. The salt in the permafrost brine veins keeps the water from freezing at the ambient permafrost temperature, creating a habitable but very harsh environment."

"This organism is capable of remaining active (i.e. breathing) to at least -25 degree C (minus 13 degrees F) in permafrost. The bacterium adapts to the extremely cold, salty conditions in which it is found thanks to significant modifications in its cell structure and function," they said.

## METHANE DISCOVERY

U.S. researchers say they've discovered what may be the world's largest methane seep on the ocean floor, where life thrives under extreme conditions. A marine research expedition located the seep deep in the western North Atlantic Ocean, far from the life-sustaining energy of the Sun. Life exists in the seep using a process known as chemosynthesis, which begins with bacteria that use the methane to make energy, researchers said.

That forms the basis for life in the harsh environment and could help scientists better understand how organisms can survive under these types of extreme conditions and perhaps even on other planets.

## MOON'S DISTANCE FROM EARTH

Earth is pushing the Moon away faster now than it has for much of the past 50 million years, mostly a result of the influence of tides on the Moon's orbit, a U.S. researcher says. The Moon's gravity creates a daily cycle of low and high tides that dissipates energy between it and Earth, slowing Earth's spin on its axis and causing the Moon's orbit to move farther away by about an inch and a half each year.

## HERSCHEL FINDS GALAXY MEGA MERGER

A massive and rare merging of two galaxies has been spotted in *Herschel* images that tell a tale of two faraway galaxies intertwined and furiously making stars. Eventually, the duo will settle down to form one super-giant elliptical galaxy.

The early universe was populated with large reddish elliptical-shaped galaxies made up of old stars. Scientists had wondered whether those galaxies built up slowly over time through the acquisitions of smaller galaxies, or formed more rapidly through powerful collisions between two large galaxies. See: <http://www.nasa.gov/herschel> and <http://www.esa.int/SPECIALS/Herschel>

## HOT JUPITERS

Among the hundreds of new planets discovered by the *Kepler* spacecraft are the "**hot Jupiters**." Unlike the giant planets of our own solar system, which remain at a safe distance from the Sun, these worlds are reckless visitors to their parent stars.

They speed around in orbits a fraction the size of Mercury's, blasted on just one-side by "starlight" hundreds of times more intense than the Sun's heating of Jupiter. Since most hot Jupiters are tidally locked to their stars with a permanent day side and night side, scientists can measure their infrared brightness..

The "maps" show huge day-night temperature differences typically exceeding 1000 degrees. And researchers believe these thermal gradients drive ferocious winds blowing thousands of miles per hour.

## MAGNETARS

When a massive star runs out of fuel, its core collapses to form a **neutron star** - an ultradense object about 10 to 15 miles wide. Energy released in this process blows the outer layers away in a supernova explosion and leaving the neutron star behind. Most neutron stars are spinning as fast as 43,000 times per minute but a few have a relatively low spin rate of once every few seconds while generating occasional large blasts of X-rays.

A neutron star can have a magnetic field a trillion times stronger than Earth's. Matter in a neutron star is so dense a teaspoonful would weigh about a billion tons on Earth. Because the only plausible source for the energy emitted in these outbursts is the magnetic energy stored in the star, these objects are called "**magnetars**."

Astronomers have also observed a spinning neutron star suddenly slowing down, yielding clues they can use to understand these extremely dense objects. See:

[http://www.nasa.gov/mission\\_pages/swift/bursts/new-phenom.html](http://www.nasa.gov/mission_pages/swift/bursts/new-phenom.html)

## STARBURST GALAXY

A beautiful, glittering swirl is a glowing haze of material seeming to engulf the galaxy and forming a fuzzy streak in a new image. It is a **starburst galaxy** - a galaxy with an unusually high rate of star formation. New stars being born are highlighted in sparkling bright blue regions along the galactic arms. These galaxies start off with huge amounts of gas, which is used to form new stars - once all the gas is used up, this star birth slows down. See:

<http://scitechdaily.com/images/Hubble-Views-a-Starburst-Galaxy.jpg>

### "3D" FOOD IN SPACE?

NASA and a Texas company are exploring the possibility of using a "3D printer" on deep space missions where the "D" would stand for dining. They will study the feasibility of using 3D printing for making food in space.

Over long duration missions, a variety of acceptable food is critical to ensure crew members continue to eat adequate amounts of food, and consequently, get the nutrients they need to maintain their health and performance.

### DIONE

Saturn's moon **Dione** resembles a blank cue ball. In close-up images of a 500-mile-long mountain scientists have found more evidence that **Dione** was likely active in the past and may still be active.

Cassini has detected a faint particle stream and images showed evidence for a possible liquid or slushy layer under its rock-hard ice crust. Cassini images have also revealed ancient, inactive fractures at **Dione** similar to those seen at Enceladus that spray water ice and organic particles.

Other bodies in the solar system thought to have a subsurface are among the most geologically active worlds, and have been targets for geologists and scientists looking for the building blocks of life elsewhere in the solar system.

### EARTH BIOLOGY

#### - POMPEII WORMS

Worms, named *Alvinella pompejana*, live in the hot water around hydrothermal vents in the Pacific Ocean and can tolerate a water temperature up to 178° F. They have a thick coating of a bacteria which may help to insulate them against this heat.

French scientists used a technique that maintains the extreme pressure essential to the worms' survival and were able to bring *Pompeii* worms to their labs for testing. They rank them among the most heat-loving animals known.

#### - STROMATOLITES

Layered rocks (*Stromatolites*) are structures made of calcium carbonate and shaped by the actions of other microbes that trapped and bound grains of coastal sediment into fine layers. They showed up in great abundance along shorelines all over the world about 3.5 billion years ago and were one of the earliest examples of the intimate connection between biology (*living things*) and geology (*the structure of the Earth itself*).

The growing bacterial community secreted sticky compounds that bound the sediment grains around themselves, creating a mineral "microfabric" that accumulated to become massive formations.

Stromatolites dominated the scene for more than two billion years. Then, around 1 billion years ago, their diversity and fossil abundance begin to take a nosedive. All over Earth, the layered formations that had been so abundant and diverse began to disappear. Their loss was almost as dramatic to paleontologists, as the extinction of the dinosaurs millions of years later, although not as complete:

Living Stromatolites and Pompeii worms can still be found today. *On other worlds also?*

### DETECTING CME'S

Chinese scientists say they've found a new way to track CME's (solar *coronal mass ejections*), - the hazardous ejections of matter from the Sun that can affect Earth. Researchers working with USA and European colleagues have developed a technique called **geometric triangulation** that can determine the trajectory and velocity of CMEs in real time as they travel in space.

### THE MOON'S GRAVITY MYSTERY

The *Gravity Recovery and Interior Laboratory* (GRAIL) mission has uncovered the origin of massive invisible regions that make the Moon's gravity uneven, a phenomenon that affects the operations of lunar-orbiting spacecraft. They pinpointed the locations of large, dense regions of mass concentrations strong gravitational pull or **mascons**. **Mascons** lurk beneath the lunar surface and cannot be seen by normal optical cameras.

### TAMING ASTEROIDS ?

Russian scientists suggest one way to protect Earth from the risk of asteroid collisions would be to use tame asteroids in a serious game of cosmic billiards - several near-Earth asteroids could be towed closer to Earth to serve as a cache of celestial projectiles against incoming space threats.

The orbiting captured asteroids could be "lined up" so that one passes 50,000 to 100,000 miles from Earth every few weeks or months, ready to be used as projectiles to target non-catalogued and hazardous asteroids. It is currently possible to send an unmanned Proton rocket to land on an asteroid, carrying up to 2 tons of rocket fuel.

Properly anchored, the rocket fuel could then ignite at a designated time, changing the tame asteroid's orbit to intercept an asteroid dangerously approaching Earth and diverting it.

### WISE FINDS ASTEROIDS

Astronomers used millions of infrared snapshots from the asteroid-hunting portion of the *WISE* all-sky survey, called **NEOWISE**, to identify 28 new asteroid families in the main belt between Mars and Jupiter. The snapshots also helped place thousands of previously hidden and uncategorized asteroids into families for the first time.

The **NEOWISE** team looked at about 120,000 main belt asteroids of the approximately 600,000 known.

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

### HEAT SIGNATURE SEARCH

A team of astronomers, engineers, and physicists has proposed a new and powerful technique to search for intelligent life that may exist on planets orbiting other stars in the Milky Way Galaxy. Currently, the SETI program has relied on the possibility of detecting intelligent beings by radio signals.

But rather than looking for radio waves, the team suggests searching for the heat signatures of nearby planets. And that, this concept would require a giant telescope that could detect infrared radiation from an exoplanet revealing the presence of a civilization.

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