THE YOUNG ASTRONOMERS NEWSLETTER

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WATER WORLDS ?

What if our Sun had not one but two habitable ocean worlds? Astronomers have found such a planetary system orbiting the star **Kepler-62**. This five-planet system has two worlds in the habitable zone - the distance from their star at which they receive enough light and warmth for liquid water to theoretically exist on their surfaces.

Modeling by researchers suggests that both planets are water worlds, their surfaces completely covered by a global ocean with no land in sight. **Kepler-62** is slightly smaller and cooler than our Sun. The two water worlds, designated ***Kepler-62e*** and ***-62f***, orbit the star in 122 and 267 days.

THE "SMALL" CLOUD

The **Small Magellanic Cloud** is a dwarf galaxy so bright that it is visible to the unaided eye from the Southern Hemisphere. Many navigators have used it to help find their way across the oceans. Modern astronomers see it as an opportunity to study phenomena that are difficult to examine in more distant galaxies.

In a recent discovery, X-ray emissions from young stars similar to our Sun were detected. They are a few thousand years old and are still embedded in the pillar of dust and gas from which stars form, as in the famous "Pillars of Creation" of the **Eagle Nebula**. See:
http://hubblesite.org/gallery/tours/tour-m16/

TO CAPTURE AN ASTEROID

In a recent announcement, a NASA plan is to robotically capture an asteroid, transport it to lunar orbit and use it as a target for a human expedition. A large robotic space tug will fly into deep space to capture the asteroid, then steer it like a tugboat to a high lunar orbit.

The mission will be conducted at a leisurely pace and could take years to complete the initial steps. By the time the mission is finally ready for launch, there will probably be numerous modifications.

THE MARS ATMOSPHERE

Curiosity confirmed that Mars has lost most of its atmosphere on its way to becoming a cold, dry planet. The rover found evidence that as much as 90% of the original atmosphere has dissipated into space over the planet's lifetime.

The thin air on Mars, about one thousand times less dense than Earth's atmosphere, does still generate dust storms and "whirlwinds".

ULTRA-LONG GRB'S

Two international teams of astronomers studying three unusually long-lasting stellar explosions conclude that they likely arose from the catastrophic death of supergiant stars hundreds of times larger than the Sun, and represent a previously unrecognized class of Gamma-Ray Bursts.

One burst continued to produce high-energy emission for an astonishing seven hours, making it by far the longest-duration GRB ever recorded.

SciWorks Planetarium info and schedules: 676-6730

ALMA'S ACHIEVEMENT

A team of astronomers used the new ALMA telescope array in Chile to pinpoint the locations of over 100 of the most fertile star-forming galaxies in the early universe. ALMA is so powerful that, in just a few hours, it captured as many observations of these galaxies as have been made by all similar telescopes worldwide over a span of more than a decade. See:
http://www.almaobservatory.org/

MARKARIAN 421

A massive flare-up of **Markarian 421**, a "***blazar***" galaxy, flooded the skies with a display of Gamma rays – the strongest ever observed.

Blazars are a unique example of "active galaxies" with supermassive black holes emitting huge amounts of light across the whole electromagnetic spectrum as they feed on surrounding matter. The galaxies emit jets of light, trillions of times more energetic than visible light, and a ***blazar*** is such a galaxy whose jet happens to be aimed directly at the Earth.

SUPERNOVA SAMPLE ?

Material from the Pacific Ocean floor may hold the signature of a distant supernova that bathed the Earth with high energy millions of years ago. If the findings are confirmed it would be the first biological signature of a specific exploding star.

The sediment core contained the isotope iron-60, which does not form on Earth, and scientists said the source was likely a supernova in our cosmic neighborhood. The iron-60 could have been gathered by certain species of bacteria that accumulates and concentrates iron from its environment

HORSEHEAD NEBULA

Looking like an apparition rising from whitecaps of interstellar foam, the iconic Horsehead Nebula has graced astronomy books ever since its discovery more than a century ago. The nebula is a favorite target for amateur and professional astronomers. It is shadowy in optical light.

The rich tapestry of the Horsehead Nebula pops out against the backdrop of Milky Way stars and distant galaxies visible in infrared light. See:
http://www.spacetelescope.org/news/heic1307

LIFE'S START ?

- **CHEMICALS**

A new study shows how a chemical, similar to one now found in all living cells and vital for generating the energy that makes something alive, could have been created when meteorites with phosphorus minerals landed in hot, acidic pools of liquids around volcanoes.

- **AMINO ACIDS**

A biologist has produced data supporting the idea that 10 amino acids believed to exist on Earth around 4 billion years ago were capable of forming proteins that could have provided metabolic activity for the first living organisms to emerge.

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

HRSCVIEW - ESA's *Mars Express* has spent nearly ten years imaging the Red Planet, and there are plenty of hidden treasures buried in the mission's rich picture archive, **HRSCview**. It offers a chance to browse and explore images of any region of the Red Planet through the eyes of *Mars Express*. See: **http://www.spxdaily.com/images-lg/noctis-labyrinthus-mars-300-lg.jpg**

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PUZZLES

Find The Word

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

CENTER
CLASS
DENSE
DENVER
EAGLE
EMISSION
ENERGY
EVERY
GREEN
HUMAN
MOVES
OCEAN
PILLARS
RADAR
ROVER
SMALL
STEER
TIMES
WATER
YEARS

Scrambled Astronomy:

CONSTELLATIONS - IN THE HOUSE

AFRUENC __ __ __ __ __ __ __

KCOCL __ __ __ __ __

LEASE __ __ __ __ __

CALES __ __ __ __ __

BATEL __ __ __ __ __

(Answers below)

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

Parachute on Mars - **http://www.jpl.nasa.gov/spaceimages/details.php?id=PIA16813**
Green Pea galaxies - **http://www.spxdaily.com/images-lg/green-pea-galaxies-lg.jpg**
Cassini's latest flyby of Rhea **- http://saturn.jpl.nasa.gov/news/cassinifeatures/feature20130311/**

SITE OF THE MONTH

Astronomical Resources on The Internet - **http://www.istl.org/02-spring/internet2.html**
Note: This is a top-notch compilation of astronomy resources. It is produced and maintained by Librarians Joe Kraus **-** University of Denver, and Pete Banholze**r** - Goddard Space Flight Center Library

****** MAY MOON ******

Last Quarter: 5/2 **New Moon:** 5/10 **First Quarter:** 5/18 **Full Moon**: 5/25 **Last Quarter:** 5/31
Apogee: 5/13 9:32 AM 252,168 mi, (405825 km} **Perigee**: 5/25 9:43 PM 222,685 mi. (358377 km)
** The May **Full Moon** is the Flower Moon. ** **Best observing nights**: 5/1 – 5/17

****** PLANETS IN MAY ******

VENUS, **MERCURY AND JUPITER** are a "trio" in the WNW dusk after mid-May. **VENUS** sets in bright twilight shortly after the Sun. **JUPITER** is visible in evening twilight and sets three hours after the Sun by month's end. **MARS** is behind the Sun until July. **MERCURY** moves behind the Sun on the 11th and re-appears one week later. **SATURN** is rising in the SE after the 18th and is in the SW morning twilight.

N	North	E	East	S	South	W	West
NNE	NorthNorthEast	ESE	EastSouthEast	SSW	SouthSouthWest	WNW	WestNorthWest
NE	NorthEast	SE	SouthEast	SW	SouthWest	NW	NorthWest
ENE	EastNorthEast	SSE	SouthSouthEast	WSW	WestSouthWest	NNW	NorthNorthWest

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

NAME	DATES	BEST NIGHT	PER HOUR	WHERE TO LOOK
ETA AQUARIDS	4/19 – 5/28	5/6 AM	60	Low in the southeast. In the 1960's, radar observations had 350 – 500 per hour. Eta Aquarids apparently can appear from any direction, and recent visual observations show more meteor activity in the southern hemisphere. May has four each of minor showers and those in daylight.

LOOK FOR: **>>>>>** ***CONJUNCTION*** **of VENUS and JUPITER** on the 28th when they will be within 1° of each other in the evening sky, - **MERCURY** is just above them. **>>>>>** **URSA MAJOR** – The Big Dipper's two end stars are the "Pointer Stars" that lead you to Polaris – the North Star. **>>>>>** A multitude of galaxies between **COMA BERNICES** overhead and south towards **VIRGO**. One of the brightest is **The Blackeye Galaxy.**

ALL ABOUT EARTH

- THE YUCATAN SITE

About 66 million years ago a mountain-sized asteroid hit the Yucatan in Mexico at exactly the time of the ***Cretaceous-Paleogene*** (K-Pg) mass extinction.

Evidence for the asteroid impact comes from sediments but the details, including what precisely caused the mass extinction, are still being debated.

Some scientists have hypothesized that infrared radiation from the upper atmosphere would have ignited fires around the globe and killed everything except those animals and plants that were sheltered underground or underwater. Other scientists have challenged the global fire hypothesis on the basis of several lines of evidence, including absence of charcoal in the sediments which would be a sign of widespread fires.

They also suggested that the soot observed in the debris from the impact site itself is far too small and actually originated from the impact site, not from widespread fires caused by reentering asteroid material.

- *LATE HEAVY BOMBARDMENT*

Researchers say that movement of the solar system's giant outer planets created a massive meteor storm that rocked the inner solar system 3.9 billion years ago.

The migrations of the giant planets created what astronomers call the *Late Heavy Bombardment*, the biggest meteor storm in our solar system's history.

Scientists have long suspected the bombardment was triggered as Jupiter and Saturn moved closer in towards the Sun while Neptune and Uranus moved further out. The resulting large numbers of meteors were thrown towards the inner solar system where they collided with the inner planets including Earth and with the Moon.

It would have also pushed asteroids and comets into the orbits they have today, the researchers said.

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MESSIER 77

Messier 77, a galaxy in the constellation of **Cetus**, is also known as ***NGC 1068*** and is one of the most famous galaxies. It has been a victim of mistaken identity - when it was initially discovered in 1780, it was labeled as a nebula. It was misclassified again when it was listed in the Messier Catalogue as a star cluster, but we now know it is a **barred spiral galaxy** with loosely wound arms and a relatively small central bulge. Dotted along each arm are knotty red clumps -- a signal that new stars are forming. These baby stars shine from nearby gas which glows a deep red color. See: **http://cdn.physorg.com/newman/gfx/news/hires/2013/1-hubbleobserv.jpg**

ISON

Astronomers used the *Swift* satellite to check out Comet **ISON** (C/2012 S1) which may become one of the most dazzling in decades when it rounds the Sun later this year. Like all comets, **ISON** is a clump of frozen gases mixed with dust (often described as "dirty snowballs") that emit gas and dust which reflects sunlight and brightens the comet.

Swift instruments detected light emitted by hydroxyl and other important molecular fragments as well as sunlight reflected from dust. Observations revealed that **ISON** was shedding about 112,000 pounds of dust and 130 pounds of water every minute,

- THE *LUNAR CATACLYSM*

US and international researchers discovered that the Moon has more in common with large asteroids roaming our solar system than previously thought. The same population of high-speed projectiles that impacted our lunar neighbor four billion years ago, also hit the giant asteroid Vesta and perhaps other large asteroids.

The findings support the theory that the repositioning of gas giant planets like Jupiter and Saturn from their original orbits to their current location destabilized portions of the asteroid belt and triggered a solar system-wide bombardment of asteroids billions of years ago – the ***lunar cataclysm***.

- MANTLE DISCOVERY

A layer of liquified molten rock in Earth's mantle may be responsible for the sliding motions of our planet's massive tectonic plates. Researchers are now trying to find the source that supplies the magma in the newly discovered layer. The discovery may help in understanding basic geologic functions of the planet to new insights into volcanism and earthquakes.

- 201,564,000 YEARS AGO

In a new study, rock dating techniques have helped narrow the timeframe of a chain of massive volcanic eruptions that wiped out half the world's species 200 million years ago.

The result is the most precise date yet -- 201,564,000 years ago -- for the event known as the ***End-Triassic Extinction***, or the fourth mass extinction. The eruptions caused a hot Earth to become even more stifling, killing off plants and animals and making way for the age of the dinosaurs -- before they too were obliterated some 65 million years ago, possibly by another volcanic event combined with a devastating meteorite strike.

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SPEEDIEST PAIR

ESA's *XMM-Newton* space telescope has helped to identify a star and a black hole that orbit each other at the dizzying rate of once every 2.4 hours, smashing the previous record by nearly an hour.

he black hole is at least three times larger than the Sun, - its red dwarf companion is only 20% that of the Sun.

They were discovered in September 2010 by NASA's *Swift* space telescope and further observations from ground and space telescopes revealed that X-rays were coming from a black hole feeding off material ripped from a tiny companion.

NEW TYPE OF SUPERNOVA

Supernovae were always thought to occur in two main varieties. But a team of astronomers is reporting the discovery of a new type of supernova called ***Type Iax***. Previously, supernovae were divided into either ***core-collapse*** or ***Type Ia*** categories. ***Core-collapse supernovae*** are the explosion of a star about 10 to 100 times as massive as our Sun.

This new type is essentially a mini supernova - fainter and less energetic than ***Type Ia***. Although both types come from exploding white dwarfs, ***Type Iax*** supernovas may not completely destroy the white dwarf.

NGC 2547

Most stars do not form in isolation, but in rich clusters with sizes ranging from several tens to several thousands of stars. While NGC 2547 (an **open star cluste**r) contains many hot stars that glow bright blue - a telltale sign of their youth, you can also find one or two yellow or red stars which have already evolved to become red giants.

Open star clusters like this usually only have comparatively short lives, like several hundred million years, before they disintegrate as their component stars drift apart. See: **http://images.sciencedaily.com/2013/03/130327092751-large.jpg**

TURBULENCE

Many newly formed stars are surrounded by ***proto-planetary disks***, swirling masses of warm dust and gas that can become the core of a developing solar system.

Protoplanetary disks may develop into celestial bodies such as planets and asteroids.

But just how they make that transformation will remain a mystery to science until researchers can get a grasp on the disordered movement, or **turbulence**, that characterizes the activity of the gases in the disks. **Turbulence** is what some people regard as "the last great classical physics problem."

SUPERNOVA 1987A

In February 1987, astronomers observing the Large Magellanic Cloud noticed the sudden appearance of what looked like a new star, but, it was the end of one and the brightest supernova seen from Earth in the four centuries since the telescope was invented.

Southern hemisphere stargazers began watching ***Supernova 1987A***, the aftermath of this enormous stellar explosion and it continues to be a focus for researchers worldwide, providing a wealth of information about one of the Universe's most extreme events.

HUBBLE BREAKS RECORD

The *Hubble Space Telescope* has found the farthest supernova of the type used to measure cosmic distances. Supernova ***UDS10Wil*** exploded more than 10 billion years ago and belongs to a special class called **Type Ia supernovae**.

These bright beacons are prized by astronomers because they provide a consistent level of brightness that can be used to measure the expansion of space.

They also yield clues to the nature of dark energy, the mysterious force accelerating the rate of expansion.

See: **http://hubblesite.org/news/2013/11**

SPIRAL GALAXIES

Spiral galaxies are some of the most beautiful and photogenic residents of the universe and nearly 70 percent of the galaxies closest to the Milky Way are spirals. But despite their common shape, how galaxies get and maintain these characteristic arms has proved to be an enduring puzzle in astrophysics.

The answers to these and other questions are now coming into focus as researchers capitalize on powerful new computer simulations to follow the motions of as many as 100 million "stellar particles" as gravity and other astrophysical forces sculpt them into familiar galactic shapes.

BIRTH OF MASSIVE STARS

In a new view of **W3,** an enormous stellar nursery, the *Herschel* space observatory tells the story of how massive stars are born. **W3** contains in the **Perseus Arm**, one of the Milky Way's main spiral arms.

By studying two regions of massive star formation - **W3 Main** and **W3 (OH)** - scientists have made progress in solving one of the questions in the birth of massive stars. Radiation blasting away from these stars is so powerful that they should push away the very material they are feeding from. But, populations of young high-mass stars may well be able to build and maintain localized clumps of material from which they can continue to feed during their earliest and most chaotic years, despite their incredible energy output. See:

http://www.nasa.gov/mission_pages/herschel/multimedia/pia16881.html

COMET 2013 A1

"There is a small chance that **Comet 2013 A1** will strike Mars in October of 2014. The nucleus of the comet is probably .6 to 1.8 miles in diameter, and it is coming in at around 125,000 mph. It if does hit Mars, it would deliver as much energy as 35 million megatons of TNT," scientists estimate.

The Mars comet is packing 80 million times more energy than the meteor that exploded over Chelyabinsk, Russia last February. For full story, see:

http://science.nasa.gov/science-news/science-at-nasa/2013/26mar_marscomet/

SOLAR STORM WARNINGS

Europe launched its first space weather coordination center that will monitor solar storms that may threaten astronauts in orbit, plane passengers and electricity grids on Earth. Though impossible to predict, a worst-case scenario mega-storm can happen at any time, leaving the world without Internet, telephones, television, electricity and air and rail transport for days on end.

A BLACK HOLE'S DINNER

Astrophysicists witnessed the rare event of a black hole snacking on a planet-sized object. The black hole had been slumbering for 30 years before chomping on a giant, low-mass object that had wandered too close. They had spotted a light flare coming from the black hole in the center of the **NGC 4845** galaxy.

Astronomers estimate there many errant planets in the Universe as there are stars -- plenty for meal options

STAR FACTORY

Astronomers discovered an extremely distant galaxy making stars more than 2000 times faster than our own Milky Way. Seen at a time when the Universe was less than a billion years old, its mere existence challenges our theories of galaxy evolution. The galaxy, known as **HFLS3**, appears as little more than a faint, red smudge yet appearances can be deceiving: this small smudge is actually a star-building factory, furiously transforming gas and dust into new stars. It has one of the highest star formation rates ever seen in any galaxy.

The YOUNG ASTRONOMERS NEWSLETTER is distributed by the Forsyth Astronomical Society.

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