

THE YOUNG ASTRONOMERS NEWSLETTER

BEYOND NEW HORIZONS

NASA has carried out the last of four maneuvers for the New Horizons spacecraft as it continues beyond Pluto and into the Kuiper Belt. The intended target in the KB is 2014 MU69, a billion miles further from the Sun than Pluto. The proposed encounter with MU 69 is January 1, 2019.

LIQUID WATER ON MARS

NASA has found evidence for the existence of liquid water flowing on the surface of Mars. The Mars Reconnaissance Orbiter (MRO) has observed streaks of flowing liquid that appear and disappear according to the seasons (surface temperatures). They are called recurring slope lineae (RSL) and there is good spectral evidence that the streaks are caused by concentrated aqueous salt solutions. Ordinarily, water would evaporate or sublime under the low atmospheric pressure on Mars, but the high salt concentrations prevent that. The salts are a mixture of magnesium and sodium perchlorate and chlorate.

Salty deposits have been found by the Curiosity rover, which supports the MRO findings.

<http://www.nasa.gov/press-release/nasa>

RARE FOR PULSARS TO HAVE PLANETS

Pulsars are spinning dead stars packed with neutrons. They are formed as the result of supernova explosions of massive stars. Therefore, it is surmised that such a process would disperse any protoplanets or disks of dust and gas that could evolve into planets. Nevertheless, two pulsars with planets have been discovered. That's out of 151 known pulsars. (Science News Magazine, Aug. 3, 2015).

WATER, WATER, EVERYWHERE

In addition to our Earth and Mars, water has been detected on other Solar System bodies.

For example, Jupiter's moon, Europa has a smooth and fluid surface of ice and mineral-laden liquid water. Heat from tidal flexing of the interior of Europa has kept the subsurface water in a liquid state. Furthermore, the heat generated gives rise to plumes of water vapor detected by the Hubble Space Telescope.

Similarly, geysers of water have been detected coming from the surface of Saturn's moon Enceladus. As with Europa, gravitational forces provide enough frictional heating to keep the water in the liquid state.

As the Messenger probe made its final low-level passes over Mercury, it observed ice deposits in the shadows of craters. The probe completed its four years of study of Mercury by crashing into the planet's surface on April 30, 2105.

Spectral analysis of the surfaces of Pluto and its moons, indicate that water ice is a significant component of these distant bodies as well.

Of course, asteroids and comets also carry some water.

SPACE PLANE

The British Company, Reaction Engines is developing an unpowered, reusable hypersonic space plane called Sabre. Sabre will use both jet and rocket engines. The jet engines (breathing air) will power the plane into the sky from a runway. Then in the upper, thin, atmosphere, the plane will switch to rocket propulsion and reach orbital velocity.

MARS LIVEABLE?

The German Aerospace Center has determined that Earth lichens can survive under simulated Mars conditions. They provided an environment that attempted to match Mars' temperature, atmosphere, sunlight and minerals. (Wikipedia, 11/11/15).

NEARBY EXOPLANET

Astronomers have discovered a new exoplanet labeled GJ1132b which is about the size of the Earth and is relatively close by, at 39 light years. The planet's central star is a red dwarf. GJ1132b's size and distance allows astronomers to train their telescopes to see if the planet has an atmosphere. It is not likely that GJ would harbor life, since its surface temperature is 232°C (450°F) and it spins around its star at a distance of only 2.2 million km (1.4 mill. miles). By comparison, Mercury is 58 million km (36 mill. mi.) from the Sun.

REPLACEMENT FOR THE SPACE SHUTTLE

NASA is developing a new system, called Orion, which will take a crew into space and return it safely. Orion has already, in the past year, undergone a number of tests. A complete vehicle is expected to be launched in 2018 and the first launch with a human crew is expected to take place in 2023.

Missions for Orion are planned for a crew of four and are expected to last up to 21 days. This would allow it to reach the Moon as a support for lunar landings. The crew vehicle compartment is larger than the Apollo capsule, which held a crew of three. Orion has the volume of a couple of minivans and is large enough to allow the crew to stand up. (American Scientist, Nov-Dec. 2015).

EXPENSIVE SCIENCE

The Large Binocular Telescope (LBT) located on Mount Graham in Arizona, at an altitude of 10,700 ft., is gradually becoming fully operational. This complex telescope utilizes two 8.4m (27 ft.) mirrors and incorporates adaptive optics. The development of the LBT has been tedious and expensive. Construction began in 1996 and one mirror received first light in 2005. The second mirror became

operational in 2008. With adaptive optics working on one mirror, the resolution of the telescope is said to be three times that of the Hubble space telescope. When both mirrors will be using adaptive optics, the resolution is expected to be ten times that of the Hubble.

The LBT is supported by several universities in the U.S., as well as international institutes in Italy and Germany. It cost \$130 million to build and \$13 million per year to operate. Figuring in the investment, upkeep and staff salaries, it has been estimated that the cost for telescope use is \$90,000 per night. (Arizona Daily Star)

A good UTube summary of the LBT can be found at https://www.youtube.com/watch?v=GUsU1OH_PA4.

For a cost comparison: the Large Hadron Collider cost for construction and operation comes to about 13.25 billion dollars (Forbes Mag.) Annual costs run at about \$1 billion.

ROAMING PLANETS

It is surprising to discover that there are planets drifting through space, and they are not associated with a parent star. These solitary travelers may alter the definition of a planet. As one might expect, such rogue planets are hard to detect. The few that have been found were detected by various means. For example if the planet is sufficiently hot, it can be detected by infrared telescopes. They can sometimes be detected by their gravitational lensing of light from distant stars. (Science News, May 16, 2015)

HUBBLE DEEP FIELD

The Hubble Telescope's image of a deep field segment of the Universe has changed our perspective of the cosmos. The first Hubble Deep Field image (HDF) was produced in 1995 from 150 orbits over ten days. The area studied is less than a tenth that of the full moon.

ASTRONOMICAL EVENTS FOR DECEMBER, 2015

Moon phases: Full: Fri. 25; New: Fri. 11; First Quarter: Fri. 18; Last Quarter: Thurs. 3

Meteor showers: Phoenicid meteors: 6; Puppis meteors: 7; Monocerotid meteors: 9; Sigma Hydrid meteors: 11; Geminid meteors: 13; Coma Berenicid meteors: 16; Leo Minorid meteors: 20; Ursid meteors: 23

Winter solstice: Tues. 22 (4:48 UT)

Planets in pre-dawn, eastern sky: Jupiter, Mars, Venus, Saturn (barely)

Uranus in southwest at midnight.

ORION THE HUNTER CONSTELLATION This is one of the most recognized of all constellations. It is high up in the south in late evening in mid month. Look for three stars in a row, which make up Orion's belt. From east to west, they are called: Alnitak, Alnilam and Mintaka. Hanging from the belt is Orion's sword, a string of stars pointing southward, and there, also you'll see the Orion Nebula.

H	R	G	A	M	O	W	G	I	C	BRAHE	GAMOW
O	K	E	P	L	E	R	A	C	O	CASSINI	HALLEY
T	H	I	R	S	G	N	L	A	P	COPERNICUS	HUBBLE
R	E	N	S	L	W	O	I	S	E	EINSTEIN	KEPLER
H	R	S	E	O	T	B	L	S	R	GALILEO	NEWTON
U	S	T	V	H	C	J	E	I	N		
B	C	E	N	E	W	T	O	N	I		
B	H	I	B	R	A	H	E	I	C		
L	E	N	H	A	L	L	E	Y	U		
E	L	I	S	K	E	I	H	M	S		

MATCH THE CONSTELLATION TO ITS ALPHA STAR (The alpha star in a constellation is usually its brightest) Put a letter next to the constellation to match it to its alpha star. (Answers are at bottom of the page. Note: there are a couple of extra stars listed.)

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|---------------------|---------------|------------|
| 1. Aquilla _____ | A. Betelgeuse | M. Capella |
| 2. Auriga _____ | B. Antares | N. Vega |
| 3. Canis Maj. _____ | C. Spica | O. Castor |
| 4. Cygnus _____ | D. Polaris | P. Sirius |
| 5. Gemini _____ | E. Regulus | |
| 6. Leo _____ | F. Aldebaran | |
| 7. Lyra _____ | G. Fomalhaut | |
| 8. Orion _____ | H. Canopus | |
| 9. Scorpius _____ | I. Arcturus | |
| 10. Taurus _____ | J. Altair | |
| 11. Ursa Min. _____ | K. Alnitak | |
| 12. Virgo _____ | L. Deneb | |

Astronomy Club website: <http://www.fas37.org/>

SciWorks phone: 336-767-6730

1.-J; 2.-M; 3.-P; 4.-L; 5.-O; 6.-E; 7.-N; 8.-A; 9.-B; 10.-F; 11.-D; 12.-C