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YOUNG ASTRONOMERS NEWSLETTER

LIQUID WATER DETECTED ON MARS

Radar images received by the Mars Express spacecraft, indicate that there could be aqueous solutions under Mars' southern frozen ice cap. A new study published in *Science* 2018 describes a 20-km wide highly reflective region with a unique signature that has also been observed with subsurface water on Earth.

Previous estimates of temperature under the ice cap of -68^{o}C, precludes the existence of water in its pure liquid form. However, dissolved salts, such as perchlorate salts of magnesium, calcium and sodium, which are known to be in martian soil, could lower the freezing point of the solution sufficiently to maintain liquidity. The aqueous beds appear to be under 1.5 km of ice (solid carbon dioxide), so pressure may also be a factor in keeping the underground lake from freezing.

The study by the Mars Express was conducted by Roberto Orosei and colleagues of the Italian National Institute of Astrophysics. [Chem. & Eng. News, July 30, 2018].

WHAT IS THE MOST MASSIVE STAR?

Search for the most massive stars is difficult and full of guess-work. First, stars more massive than say, 25 solar masses are hard to find and they are usually thousands of light years away and they are often shrouded in surrounding clouds of dust and gas.

Determining a star's mass can be obtained with more confidence if it is part of a binary system. In that way, astronomers can use Newton's/Kepler's laws to give them more reliable values. Lone stars with suspected large mass have to be estimated on the basis of their age and location in stellar evolution. So, we can expect that there will be a lot of revisions in the future.

At this point, it appears that the most massive star is designated as R136a1 located in the Tarantula Nebula in the Large Magellanic Cloud (visible in the southern hemisphere), about 163,000 light years away. Its mass is estimated at over 300 solar masses.

This large value is at the theoretical limit, called the Eddington Limit, obtained by calculations, which preclude masses more than several hundred solar units. This is based on a balance between outward radiation from the star's core and the inward push of gravity. [Space.com, July 28, 2018 and Encycl. Brit.].

MAR'S GLOBAL DUST STORM IS SUBSIDING, BUT OPPORTUNITY IS STILL NOT RESPONDING

The Mars rover, Opportunity has been sleeping for 61 days (as of Aug. 10) since June 10 due to the monster global dust storm that began in May and blotted out the Sun. The dust coated the rover's solar panels and reduced their efficiency. A programmed sleep cycle was initiated, and we now wait for gentle breezes to clear away the dust.

The mission team makes daily wake-up calls, but so far, there has been no response. Mission team members have created a betting pool for predicting when the rover will call home. Dates range from July to mid-September. [Space.com, Aug. 10, 2018].

COMPANION STARS CAN SURVIVE A SUPERNOVA BLAST

The Hubble Space Telescope has captured the first-ever photograph of a star which was a close-in observer and possibly an indirect participant in a supernova explosion of its neighboring star. The HST captured the

companion in the fading afterglow of the explosion. The supernova occurred in the galaxy NGC 7424 which is 40 million light-years away. The supernova is identified as SN 2001ig and has been classified as a Type IIb stripped-envelope supernova.

This means that the companion star's gravity stripped away the outer atmosphere of hydrogen prior to the explosion. Lead author in the published article, Stuart Ryder of the Australian Observatory in Sydney, stated that the majority of massive stars are binary pairs. The junior partner star can cause instabilities in the supernova's progenitor and lead to an epic explosion. When the shock wave from SN 2001ig hit the companion star, its outer gaseous envelope temporarily deformed, but was not blown away. So, the HST was able to obtain an image of the surviving star.

Now there is much incentive to look for massive star doubles which might be of the stripping type. [Astronomy, Sept. 2018].

MAYBE NO PLANET X AFTER ALL?

A paper given at the American Astronomical Society meeting in Denver, makes a case for there not being a large planet located way out in the Kuiper Belt. A group of astronomers from the University of Colorado has proposed that the combined gravitational pull of the whole assembly of TNO's (trans-Neptunian objects) is giving the appearance of a single object, when, in fact, it is a collective effect from many bodies.

Mike Brown, the Caltech astronomer who proposed the existence of a ninth planet way out in the Kuiper Belt, agrees with the analysis.

The final paper is still in preparation, so we have to wait and see if it can stand public scrutiny. [Sky & Tel. Sept., 2018].

IMPROVEMENTS IN GRAVITY WAVE DETECTION

The two LIGO systems (Laser Interferometer Gravitational-wave Observatory), one in Washington state and one in Louisiana, have made astronomy history by detecting gravity waves emanating from gigantic collisions in deep space: between two black holes in 2015; and between two neutron stars in 2017. The latter pulse was also picked up by the European Virgo detector located in Italy, and within seconds, observatories around the world were able to detect a gamma ray burst and other frequencies of electromagnetic radiation.

These successes have promoted the planning and construction of other, more sophisticated detection systems. In Japan, the Kamioka Gravitational Wave Detector (KAGRA) is expected to come online in 2020.

Currently, the North American Nanohertz Observatory for Gravitational Waves (NANO-Grav) supported by the National Science Foundation is looking for millisecond pulsars using the Arecibo Observatory in Puerto Rico and the Green Bank radiotelescope in West Virginia.

The idea here is that if gravity waves can push and pull space, there will be a detectable distortion of the steady radio frequency coming from pulsars (rapidly spinning neutron stars).

Also, there is planned for the 2030's the placement of three interferometer coupled spacecrafts which will use lasers to detect distortion in the structure of space: Laser Interferometer Space Antenna (LISA). [Amer. Scientist, Sept.-Oct. 2018].

ICE DETECTED ON THE MOON!

Data from NASA's Moon Mineralogy Mapper (M3) spectrometer on board the Indian Chandrayaan-1 spacecraft has detected frozen water deep in lunar craters locate at the north and south poles. [Space.com Aug. 23, 2018].

BIRTHDAYS IN SEPTEMBER: James Alfred Van Allen (Amer.) b. Sept. 7, 1914, d. Aug. 9, 2006. Pioneer in the field of magnetospheric astronomy. Van Allen Belt of Earth named after him.
James Hopwood Jeans (Eng.) b. Sept. 11, 1877, d. Sept. 16, 1946. Physicist, astronomer, mathematician. Worked in quantum theory, stellar evolution and dynamics of star formation from nebular clouds.

MOON PHASES IN SEPTEMBER: Last Qtr.: Sun. the 2nd.; **New:** Sun. the 9th.; **First Qtr.:** Sun. the 16th.; **Full:** Mon. the 24th.

THE PLANETS IN SEPTEMBER: As September progresses**, Venus** drops toward the western horizon and becomes less obvious after it peaks in brightness on the 21st (mag. -4.8). During the last week of the month it is very close to **Jupiter. Jupiter** (mag. -1.9) is less bright than Venus. But the two bodies stand out in the west after sunset. Continue your scan eastward and find **Saturn** high, due south, a bit north of Sagittarius. And continue to the east to see the bright, orange-red **Mars,** situated in the south-southeast. To get a better view of the red planet, wait until later in the evening, around 10 p.m. when there is less atmospheric haze to contend with. Mars is becoming less bright (mag. -2.1) as it moves away from its close approach in July. **Mercury** shines low in the east 90 minutes before sunrise and should be easy to spot during the first week of the month at magnitude -0.8.

AUTUMNAL EQUINOX ON SEPTEMBER 22nd.

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CONSTELLATIONS IN THE SEASONS:

Place a letter in the blank which best matches the constellation to the season during which it is best observed (Circumpolar means that the constellation is close enough to the North Star that it never dips below the horizon.) Answers below:

1. Cygnus ____
2. Pegasus ____
3. Orion ____
4. Ursa Major ____
5. Leo ____
6. Taurus ____
7. Scorpius ____
8. Cassiopeia ____

A. Winter
B. Spring
C. Summer
D. Fall
E. Circumpolar

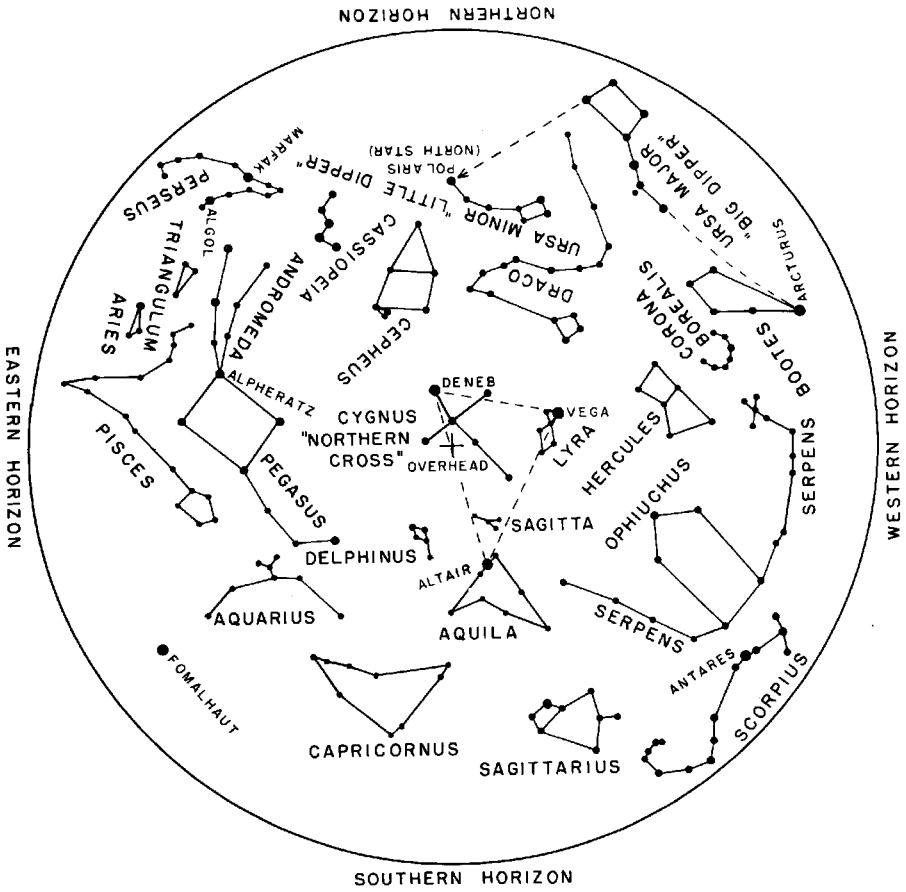
THE FORSYTH ASTRONOMICAL SOCIETY: Meets on the second Wednesday of the month at 7:30 p.m. at the Kaleideum North (formerly SciWorks), 400 W. Hanes Mill Road. Visitors are welcome. For information about ongoing activities, check the FAS website: http://www.fas37.org.
Activities for September: Saturday, the 1st , observation at Stone Mountain State Park (see the astronomy club website for the location map in the park – http://www.fas37.org). Saturday, the 8th at the club's Bullington observatory (see the website for directions). Saturday, the 15th : public observation at Kaleideum. For any of the scheduled observations, the public is asked to arrive about a half hour before sunset. This is to minimize the use of car headlights.
Regular monthly meeting: Wednesday, the 12th at Kaleideum, at 7:30 p.m.
For information about observation scheduling or cancellation, try the front desk at Kaleideum: 336-767-6730; ext. 1000.

See the sky map for September on page 4. This is also sufficient to be used for the whole fall season.

Answers: 1.- C; 2. – D; 3. – A; 4. – E; 5. – B; 6. – A; 7. – C; 8. – D or E

THE FALL SKY

In the fall, our angle of view of the sky is away from the cross section of the Milky Way, so, we see fewer stars than in the summer or winter. The best way to get oriented is to look high overhead, even slightly toward the northern sky. There, you'll see the big W of Cassiopeia (queen of Ethiopia). From Cassiopeia, drop down a little toward the south and you'll see a rather open space, but with four stars making up the corners of a giant square. The stars are not very bright (second mag.) but there's not much else in the area to confuse you. This is the Great Square of Pegasus, the flying (winged) horse. Remember that the horse is upside down and the rump of the horse is missing. If you trace from the corner Peg. star closest to Cass. and stop roughly half way, you can see our neighbor galaxy, Andromeda. And. can be seen with the naked eye only by people with good vision and in an ideal (dark) location. It is next to the Andromeda constellation. You will probably have to use binoculars. Andromeda shows up as fuzzy spot. It is a spiral galaxy, like the Milky Way, and it is about two million light years away. The Milky Way is running diagonally from Scorpius through Cygnus and through Cassiopeia. In September, Cass. is a bit off to the northeast and you can still see Cygnus and the summer triangle. Later in the fall, Cass. and Peg. will be straight up.



THE NIGHT SKY IN SEPTEMBER