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THE YOUNG ASTRONOMERS NEWSLETTER

LAST INFO ABOUT PLUTO FROM NEW HORIZONS HAS BEEN RELAYED TO EARTH

NASA has announced that the spacecraft New Horizons has completed its transmission of data related to its study of Pluto and its moons.

New Horizons zipped by the dwarf planet Pluto in July of 2015. The spacecraft travelled so rapidly that there was not sufficient time to do a live-stream relay of data back to Earth. Instead, only specific, pre-programmed data collected during the pass was sent back to home base. (5 hours, eight minutes one way at light speed) New Horizons stored the rest of the data in its digital recorders. It then took 15 months to transmit the remaining 50-plus gigabits of information.

New Horizons' two onboard recorders will be given a final check-up before their memories are cleaned out in preparation for the next Kuiper Belt body to be visited. [http://pluto.jhuapl.edu/News-Article.]

EXOMARS MAY BE ONLY PARTIALLY SUCCESSFUL DUE TO CRASH LANDING OF SCHIAPARELLI

The ExoMars mission, launched 14 March by the cooperative efforts of the European Space Agency and the Russian Federal Space Agency, reached the red planet in good shape. However, something went wrong in the attempted release and landing of the Schiaparelli lander. It is believed that the parachute deployed in nominal fashion, but possibly the braking rockets did not fire for a sufficiently long period. As a consequence Schiaparelli went into freefall, resulting in a crash landing. The NASA Mars Reconnaissance Orbiter took photos of the proposed landing site on Oct. 19, and imaged a 2.4 meter diameter crater, which is consistent with an impact by a 300kg object. Further images will be taken which may give more information as to what went wrong.

In the meantime, the mother ship: the Trace Gas Orbiter, seems to be functioning well. [exploration.esa.int/mars/]

THE MAGNUM OPUS OF COSMOS STUDY IS THE SLOAN DIGITAL SKY SURVEY

The Sloan Digital Sky Survey (SDSS) was created in 1998 and has undergone numerous improvements and variations in goals and sophistication (SDSS I II, Legacy, Seque, Boss, APOGEE, etc.). It was established to generate photo images and spectra of millions of astronomical objects. Approximately one-third of the sky has been surveyed. The primary Earth-based telescopes are located in New Mexico. The topic is too varied and complex to summarize in this Newsletter. Interested readers are directed to the website: www.sdss.org. Also see Astronomy, November, 2016, p. 10. Further evidence that astronomers will not rest until every star in the universe is identified and characterized. (editor's humor) But the work may help us to understand the cosmic forces of dark matter and dark energy.

GALAXIES IN COLLISION

Galaxy clusters are dangerous places that harbor hundreds of galaxies in relatively small volumes of the cosmos, such as the space between the Milky Way and Andromeda galaxies (about 2.5 million light years distance). In such settings the gravitational attraction between galaxies leads to frequent mergers or near-mergers. Flybys can result in big galaxies stripping away the outer stars and matter from smaller galaxies. This leaves

behind small, compact dwarf galaxies that were not totally engulfed by such encounters. These tiny "ultracompact dwarfs" have been recently identified and categorized. It is speculated that some of the Milky Way's own globular clusters evolved this way.

As a large galaxy gobbles up a smaller one, the resultant glutton's increased mass simply makes its gravitational pull stronger and more able to take on even more neighbors.

Astronomers have identified innumerable stars and star clusters that seem to move freely and not be gravitationally bound to any galaxies. These might be escapees from galaxy collisions.

There is mounting evidence that the Milky Way is also guilty of cannibalism. Streams or ribbons of stars in the outer fringes may be the residues of absorbed neighbor galaxies. Similar outlying streams have also been detected in the Andromeda Galaxy. Who will the Milky Way gobble up next? A possible victim is the Canis Major dwarf galaxy. Or, there are the Small and Large Magellanic Clouds. And, how about the prediction that Andromeda will envelope the Milky Way about 4 to 5 billion years into the future. It has been calculated that the two bodies are on a collision course. We humans probably have no need to worry about this. The Sun and Solar System may not even be in existence that far into the future. [Astronomy, Dec., 2016].

PERILS TO HUMANS DURING SPACE TRAVEL

There is growing excitement about the possibility of sending a human crew to Mars. The public may be a bit too naïve in its anticipation of following the adventures of astronauts as they hurdle through space and explore distant bodies. However, there are numerous hazards that are a serious threat to the health and safety of future space travelers.

NASA has employed a variety of health specialists ranging from medical doctors to physical therapists, trainers and dieticians to study what might be the effects of prolonged space travel. The members of the crews on the International Space Station have been carefully monitored for physical and psychological changes that must be taken into account.

Recently, Russian astronaut, Mikhail Kornienko and American astronaut, Scott Kelly spent almost a year (340 days) at the ISS with the goal to determine the effects of this alien environment on the body. Genetic studies were aided by monitoring Scott's twin brother, Mark, who remained the control subject on Earth.

When the two space subjects returned to Earth on 1 March, 2016, they were both overwhelmed by the sudden force of gravity and could barely walk.

Some effects of prolonged weightlessness:
Muscles lose mass at about 5% a week.
Bones become more weak and brittle as they lose calcium at about 1% per month.
The release of calcium from the bones into the blood can give rise to kidney stones.
The body can lose up to 22% of normal blood volume.
Lungs, heart and chest muscles become weak.
Faces become puffy since fluids don't drain down into the body.
There is some vision impairment since fluid collects in the brain and presses on eyeballs.
The spine stretches out. Kelly was 2 inches taller after the year in space.

In addition, we have to be concerned about increased radiation in space. [see National Geographic, Nov. 2016. and Nat. Geog. special series beginning Nov. 14].

In his interview with CNN on September 28, Kelly said that he was willing to make the three-year round trip to the red planet.

DECEMBER BIRTHDAYS: Isaac Newton (Eng.): b. Dec. 25, 1642; d. Mar. 20, 1727. Astronomer, mathematician, physicist. Accomplishments too great and numerous to summarize here. **Annie Jump Cannon (Amer.):** b. Dec. 11, 1863; d. April 13, 1941. Studied star luminosity. Established the O, B, A, F, G, K, M classification of star luminosity/temperature. **Gerard Peter Kuiper (Amer., Dutch born):** b. Dec. 7, 1905; d. Dec. 23, 1973. Predicted the region of bodies out beyond Neptune, now called the Kuiper Belt. **Johannes Kepler (Ger.):** b. Dec. 27, 1571; d. Nov. 15, 1630. Formulated the three famous laws of planetary motion. **Arthur Stanley Eddington (Eng.):** b. Dec. 28. 1882; d. Nov. 22, 1944. English astrophysicist who worked out the various laws for stellar pressure-temperature dynamics while utilizing Einstein's theory of relativity.

Moon phases for December: First quarter: Wed., Dec. 7; Full: Tues., Dec. 13; Last quarter: Tues. Dec. 20; New moon: Thurs. Dec. 29.

Winter Solstice December 21. Make an alidade (a type of sextant) to measure the height of the Sun at noon. See the June 2016 issue of the Newsletter (in the FAS website) for how to make a simple alidade.

The planets for December: Mars, Venus and Mercury are in the southwest after sunset. The trio change places periodically throughout the several weeks of winter. Venus and Mercury rise higher, but Mercury starts to sag to the west after the tenth of the month. Venus continues to gain altitude and brightness (mag. -4.2) while it moves into Capricorn later in the month. Mars comes very close to Neptune on New Year's Eve, in Aquarius.

In the east, **Jupiter** rises high in the morning before sunrise. Find it in Virgo. **Saturn** has been hiding for the past few weeks, but we see it starting to appear in the east before sunrise as we approach the end of the month.

Word Search: Some famous NASA astronauts.

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

Buzz **ALDRIN**
Neil **ARMSTRONG**
Frank **BORMAN**
Scott **CARPENTER**
Eugene **CERNAN**
Roger **CHAFFEE**
Michael **COLLINS**
Gordon **COOPER**
John **GLENN**
Virgil **GRISSOM**
Christa **MCAULIFFE**
Sally **RIDE**
Walter **SCHIRRA**
Alan **SHEPARD**

Little known facts: The planet Mercury has the most elliptical orbit (least circular) of the eight planets and it is the most inclined from the plane of the solar system. At its perihelion (closest approach) the Sun would take up 1.7 degrees of the sky when viewed from Mercury. That's 50% larger than how it would look at Mercury's aphelion.

Forsyth Astronomical Society website: http://www.fas37.org

SciWorks telephone: 336-767-6730 ext. 1000 Have a great Christmas holiday! Bob Patsiga, editor