

THE YOUNG ASTRONOMERS NEWSLETTER

JUNO IS GIVING US HISTORIC VIEWS OF JUPITER

Since arriving at the gas giant on July 4, Juno, NASA's mission to Jupiter, has taken its first high resolution photos of the surface. As it executes its polar orbits, it has been able to image the polar regions as never before. On August 27, it made its first close pass over the clouds at an altitude of about 2000 miles. Photos of the polar regions indicate a turbulent, stormy area, with no sign of the banding seen in the equatorial region.

Juno took just six hours to fly from pole to pole. But it will now shoot out to its most distant point in its orbit at over a million miles. Measurements will be focused on the determination of the abundance of water and ammonia in the planet's atmosphere, and magnetic and gravitational measurements will attempt to deduce the structure of the core. Is the core gaseous, liquid or solid?

There will eventually be 36 flybys and the mission will end in February, 2018 by the probe crashing into the planet.

Overall administration of the mission is by NASA through its New Frontiers Program, but the daily control is through the Southwest Research Institute in San Antonio, Texas.

NEW HORIZONS KEEPS TRUCKIN ALONG

The New Horizons probe has now moved well beyond Pluto and is cruising through the Kuiper Belt at the fringes of our Solar System. It is 3.3 billion miles from Earth and 310 million miles beyond Pluto, clipping along at 14 kilometers per second. It is so far out that speed of light round trip radio messages take nearly ten hours. All systems seem to be working beautifully. As it travels, the probe is recording

information about other Kuiper Belt Objects (KBO's)

New Horizons reached Pluto in July of 2015. NASA has given New Horizons its next target, the KBO 2014 MU69, which it is expected to reach on New Year's Day, 2019.

The Kuiper Belt is the region beyond Neptune that consists of dwarf planets and smaller bodies. [<http://pluto.jhuapl.edu>]

THE MARS ROVERS

Curiosity: After four years of exploring Mars, Curiosity has moved out of Gale Crater and is continuing up the slope of Mount Sharp (proper name: Aeolis Mons). During its travels, Curiosity has found organic molecules, including methane (possibly formed by microorganisms) and it has found evidence that the Gale Crater held lakes in its basin.

One impediment to Curiosity's progress is the proximity to RSL's, Recurring Slope Lineae. RSL's are dark streaks that appear on Martian slopes. They randomly appear and disappear. Some planetary geologists propose that they are caused by water (geological aqueous solutions) oozing from the subsurface. Some believe that they result from freezing and sublimation of carbon dioxide (the main gas in the atmosphere of Mars), and still others speculate that they may be caused by the flow of bone-dry debris.

In any case, NASA does not want Curiosity to travel near any of the RSL's, lest earthly microorganisms contaminate the subsurface aquifers. Curiosity was not completely sterilized before leaving Earth in 2011. Therefore, a new path must be found to climb Mount Sharp. The plan is to not allow Curiosity to get closer than 2 km to a RSL. [www.Universetoday.com].

P. 2

Opportunity: Good old Opportunity. It has been doing great work over these past twelve years since its arrival at the red planet. Lately, though, it has been experiencing some memory problems, that the human support team is dealing with.

Right now, Opportunity is making its way out of Marathon Valley, located on the rim of Endeavor Crater. Its mission has been extended for two more years and it has covered 26.5 miles since landing on Meridiani Planum in January, 2004. Earth controllers must be sure that Opportunity's solar panels stay dust free and take advantage of the Sun's angle.

Opportunity's sister rover, Spirit got stuck in a sand ditch in 2009 and stopped transmitting in 2010. [Space.com].

ROSETTA SPACECRAFT CRASH LANDING ON COMET 67P

The European Space Agency's two-year science mission by its Rosetta probe will come to an end. It should have completed its death dive into the comet 67P/Churyumov-Gerasimientko by the time this *Newsletter* goes to publication. The probe is scheduled to crash land on the evening of September 29 on the smaller of the two lobes that make up the comet. By coincidence, Rosetta will end up just a few kilometers from Philae, its comet lander. The ESA lost the location of Philae until just recently.

On its descent, Rosetta will be photographing the comet and making various analyses of its gaseous envelope. [www.esa.int/Our_Activities/Space_Science].

STRANGE SIGNALS FROM STARS

Over the decades, earth-bound receivers have detected signals from space which cannot be

related to natural phenomena, such as exoplanets or novae. Could these signals be coming from intelligent beings in outer space? - Back in 1977, the Ohio State University radio telescope detected a signal from the constellation Sagittarius. It lasted for 72 seconds. The OSU researcher that spotted the blip on his chart, wrote WOW! And ever since, this was known as the WOW signal. At the time, no one could come up with an explanation for the origin of the signal.

Then in May of 2015, the Russian radio telescope RATAN-600 detected a signal from a star in Hercules, a distance of 95 light years. This signal lasted for just 2 seconds, but is of special interest because the star, HD 164595, is of a class similar to our sun, and it has an exoplanet orbiting it (but very close to the star, and presumably, very hot). The Russian astronomers did not report their finding until August of 2016. The (Search for Extraterrestrial Intelligence) SETI Institute is attempting to follow up on this, but has so far, not detected additional signals.

However, this may all be much ado about nothing. In January, a Florida astronomer determined that the WOW signal likely came from two comets [Time magazine, Sept. 12 – 19, 2016]. And the RATAN-600 signal frequency overlaps with those allotted to military use. [universetoday.com]. So, maybe we are not listening to aliens (yet).

JACK GARMAN, NASA ENGINEER WHO MADE A CRITICAL DECISION IN THE APOLLO 11 MOON LANDING DIES AT 72

Jack Garman was the engineer who oversaw the computer software support group for the Apollo 11 moon landing in July, 1969. As the LEM was making its descent, Neil Armstrong discovered a warning light on his instrument panel, which indicated a system overload. Jack

assessed the problem and gave the recommendation to proceed. This was a split-second decision that led to the safe and historic landing.

Garman was also on the team of engineers that brought back the beleaguered Apollo 13 in 1970. The team members received the Presidential Medal of Freedom.

Garman died on September 20, of bone cancer. (New York Times, Sept. 24).

PLANET DISCOVERED AT SUN'S NEAREST STELLAR NEIGHBOR

The nearest star to us is the triple star system known as Alpha Centauri, which is about 4.3 light years away, and visible in the southern hemisphere. One of the stars in the system is Proxima Centauri, a red dwarf, which is the closest star to us at a distance of 4.22 light years. In August, Guillem Anglada-Escudé of Queen Mary University of London reported the existence of a planet orbiting Prox. Cent. This planet has been designated as Proxima b, and it orbits its star every 11.2 days. It is about 1.3 times as massive as the Earth.

Since Prox. Cent. is a red dwarf, it is cooler than our sun and so even at its close distance, Prox. b occupies what is considered to be a habitable zone, where liquid and frozen water might be found. Furthermore, red dwarfs live billions of years longer than Sun-like stars. This gives Prox. b additional time to generate life.

Anglada-Escudé observed Proxima Centauri over 16 years, and detected a wobble that is attributed to the nearby presence of a planet. His observations were performed at the European Southern Observatory in Chile.

Now, futurists are considering sending a small probe to Prox. Cent. using exotic thrusting technology that could push it at near light speed. [Space.com].

MARS EXPLORATION PROGRESSES WITH ORBITER AND LANDER SENT BY JOINT EUROPEAN AND RUSSIAN SPACE AGENCIES

The ESA and Russian space agencies are collaborating on a dual-functioning probe called ExoMars. The scientific package consists of two parts: a gas analyzer and a stationary lander. The Trace Gas Orbiter (TGO) will release the lander, called Schiaparelli, on October 16, 2016. TGO will continue to orbit Mars and make measurements of methane and other gases. Schiaparelli will use battery power that is expected to last 2 to 8 Martian days.

A second mission is planned for 2020. In this phase, the lander will be mobile. [Sky & Tel., Oct. 2016].

OCTOBER BIRTHDAYS

Ejner Hertzsprung (Danish), born Oct. 8, 1873. Worked out relationships of star luminosity with size and temperature. This was independently also analyzed by American astronomer, Henry Norris Russell (born Oct. 25, 1877), and this led to the famous and useful Hertzsprung – Russell diagram.

Subrahmanyan Chandrasekhar (Indian), born Oct. 19, 1910. Was an astrophysicist who worked out the dynamics around black holes. Nobel Prize 1983.

Karl Guth Jansky (Amer.), born Oct. 22, 1905. A pioneer in radio astronomy. Detected radio waves coming from the center of the Milky Way.

Karl Schwarzschild (Ger.), born Oct. 9, 1873. Mathematician-astronomer. Developed theories about existence of black holes.

Little known facts: The total number of stars in the observable universe (approx. 1×10^{22}), is greater than the total number of grains of sand on all beaches on Earth.

OCTOBER MOON PHASES: New: Saturday the first and Sunday the thirtieth; First quarter: Sunday the ninth; Full: Sunday the sixteenth; Last quarter: Saturday the twenty - second.

PLANET INFORMATION FOR OCTOBER

Mercury: On Oct. first, it rises 90 min. before the Sun and is about 10° high in the east. By middle of the month, it is joined by **Jupiter**. As the month progresses, Mercury lowers out of sight, but the giant continues to rise in the morning twilight.

Mars: The red planet moves slightly eastward through Sagittarius, but planet and constellation gradually drop below the southwestern horizon later in the month.

Even more to the west and near the horizon is **Saturn**. The ringed planet is in the constellation Ophiuchus. Later in the month it comes close to about 5° of the rising **Venus**.

Venus is beginning to exert itself in the west, after sunset. It will very slowly rise higher as the weeks go by. Later in the fall and winter it will be the prominent evening “star”.

THE ORIONID METEOR SHOWER

The Orionid meteor shower is caused by the debris remaining from Halley’s Comet. The Orionids occur between October 2 to November 7, with peak display on the night of October 20 – 21.

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Astronomy quiz: (answers below)

- 1) Which planet(s) can never be seen on the meridian (straight up) at midnight? Mercury, Venus, Mars, Jupiter, Saturn
- 2) If the Moon is rising in the east and the Sun is setting in the west, you know that the Moon phase must be: new first quarter full last quarter
- 3) After the Sun’s core hydrogen is depleted by nuclear fusion, the core will consist primarily of: Carbon Deuterium Helium Oxygen
- 4) Two identical stars are discovered. One star is 5 light years from Earth, and the second is 50 light years from Earth. How much fainter does the farther star appear to be?
Square root of 10 10 100 1,000 the farther star does not appear fainter, since it is identical
- 5) What number is obtained if one divides 1×10^6 by 1×10^4 ?
 1×10^{10} 1×10^{-2} 1×10^2 1×10^{24}

For classroom discussion: If radio transmission on Earth was not developed until about 1920, how many light years away must a civilization be to hear us and respond so that we would hear their message today?

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Answers: 1) Mercury and Venus 2) Full 3) Helium 4) 100 (square of 10) 5) 1×10^2

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Have a great month. Bob Patsiga, editor