

YOUNG ASTRONOMERS NEWSLETTER

NASA GETTING READY TO SEND A PROBE TO THE SUN

In July of 2018, NASA will send the Parker Solar Probe toward the Sun and it will take up residence there for about seven years. At about 3.9 million miles above Old Sol's surface, the probe will be closer than any previous spacecraft.

The probe will be equipped with a carbon composite heat shield, about 7.5 feet wide and nearly five inches thick. This is designed to withstand temperatures in the vicinity of 2,500 degrees Fahrenheit, while maintaining the inner instruments at near room temperature.

Measurements will be made of the Sun's magnetic and electric fields, and photographs will be taken of the solar dynamics on the surface.

It is hoped that some of the collected data will explain why the Sun's outer corona is so incredibly hot, at 3 million degrees F, while the surface is around 10,000°F. What reactions are taking place in the corona to boost the temperatures to such extremes?

The solar probe will make 24 orbits of the Sun and end its mission in 2025.

Eugene Parker is an American scientist who in 1958, proposed the existence of the solar wind. This was confirmed in 1960 by satellite observations. [CNN online, Space.com].

THIRD DETECTION OF GRAVITY WAVES

As further confirmation of Einstein's concept of space-time, astronomers have now detected gravity waves emanating from the collision of two black holes located nearly 3 billion light-years away. The detection was accomplished through the LIGO system of instruments (Laser-Interferometer Gravitational-Wave

Observatory). Two earlier detections occurred in September and December of 2015. The most recent was made this past January. Results were reported in "Physical Review Letters", Vol 118, 2017.

The two black holes had masses of 19 and 31 solar masses; giving the final merged product a mass of 49 solar masses.

Detailed study is going on to try to determine the spins of the two black holes and relate that to their origins. Some propose that they both existed in the same dense stellar cluster.

LIGO's sister gravitational wave observatory, called Virgo, is expected to become operational in 2018 in Italy. This will create the possibility for triangulation and determination of the locations of gravity impulses.

Beyond this arrangement, a more distant future system is the European Space Agency space-based gravitational wave observatory, known as LISA (Laser Interferometer Space Antenna). Three Earth satellites will be put in orbit and they will provide interferometer arms that are millions of kilometers long. This is expected to be put in place in 2030. [NY Times, June 2; Nature.com].

TWO MORE MOONS DISCOVERED AROUND JUPITER

Two tiny moons orbiting Jupiter were discovered recently. They are really small, only a mile, or so, in diameter. They were discovered by Scott Shepard of Carnegie Institution using observatories in Chile. The introduction of new technologies into telescopes has increased their sensitivity, and this is leading to discovering tiny objects that were not seen in the past. One of the moons,

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designated as S/2016 J1, was discovered March 8, 2016. The other, S/2017 J1, was observed on March 23, 2017. The observations were corroborated by astronomers at the Subaru telescope on Mauna Kea, Hawaii.

Both moons have elongated orbits averaging over 10 million miles out from the gas giant. This gives Jupiter a total of 69 moons, although at their small size and great distance, these satellites are easy to lose. And, more may pop into view in the future.

Shepard was actually on the hunt for Planet X when he decided to detour to Jupiter's neighborhood. [Sky & Tel. web site; June 6, 2017].

WHY SO MANY GALAXIES WITH OLD RED STARS?

About 4 billion years after the Big Bang, galaxies were growing at their peak rate as new stars were rapidly forming from cosmic gas and dust. Since then, there has been a decline in star formation, and now we have many galaxies composed of old, cool, red stars. Estimates vary, but it appears that about 3 stars per year are formed in the Milky Way. Some galaxies have ceased forming stars altogether.

So, the question is: Why are new stars not forming as rapidly as in the past?

Since new stars are formed when interstellar gas and dust clouds collapse under the force of gravity, we ask: where is the gas and dust? Two theories say that the dynamics of existing stars and galaxies stirs up the interstellar space so that the clouds cannot consolidate into coherent clumps. One theory says that neighboring galaxies in tight galaxy clusters can produce ram-pressure stripping through their gravity. Another theory proposes that existing stars in a galaxy can blow away surrounding gas in a process called radiation pressure.

A third force which could drive away gas is the

radiation and particles blasting from the accretion disks of black holes.

So, it appears that star formation is a self-limiting process. [Sky & Tel. July, 2017].

EVIDENCE IS MOUNTING FOR THE EXISTENCE OF WATER ON MARS

Over time, orbiting space probes produced growing evidence that water exists on Mars. It is not liquid water, as we have in abundance here on Earth, but it is frozen water trapped under a moderate overburden of soil. This has become more and more certain as orbiting instruments, such as the Mars Global Surveyor (MGS) and Mars Reconnaissance Orbiter (MRO) have worked in tandem to match geologic features with analyses reported by Mars surface rovers and landers.

Both spectroscopic study and ground-penetrating radar show that hydrated minerals and frozen deposits of water ice exist under the surface.

The Phoenix lander sat down on a northern plain and used its digging tool to make a trench only a few centimeters deep. There, it found a slab of water ice.

The radar instrument on the MRO has confirmed the presence of two subsurface features consistent with massive deposits of water ice, enough to roughly equal the volume of Lake Superior.

Planetary scientists look forward to launching a mission in 2020 that will collect samples to be brought back to Earth for analysis. [Astronomy, July, 2017].

JULY BIRTHDAYS: Georges Lemaitre (Bel.); b. July 17, 1894; d. June 20, 1966. One of the first cosmologists to propose that the universe began with the sudden expansion of an atom-sized entity – later named (by others) *The Big Bang*. **Hans Bethe** (Ger. – Amer.) b. July 2, 1906; d. March 5, 2005. Astrophysicist who

(birthdays, cont.) worked out many of the nucleosynthesis processes taking place within stars. **Jocelyn Bell Burnell** (Brit.); b. July 15,1943. Discovered pulsars. Worked under the mentorship of Antony Hewish (see *May Newsletter*). **Henrietta Leavitt** (Amer.) b. July 4, 1868, d. Dec. 12, 1921. Discovered the luminosity relation of Cepheid variable stars. Did her work at the Harvard College Observatory. **Vera Cooper Rubin** (Amer.); b. July 23, 1928; d. December 25, 2016. Studied rotation of galaxies and proposed that dark matter was influencing cosmic behavior.

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MOON PHASES IN JULY: First Qtr.: Sun. July 30 (and June 30); Full: Sun., the 9th; Last Qtr.: Sun. the 16th; New: Sun. the 23.
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PLANETS IN JULY: **Mercury** hugs the horizon all month, and is hard to spot. **Venus** is very prominent in the east, in the early morning. Very bright at magnitude -4.2 . Jupiter has been dominant in the sky for several months, but it is now drifting to the southwest. But, it is still bright at magnitude -2.0 . Those with telescopes can see the four Galilean moons nicely lined up on July 18. **Saturn** is now taking the center stage; riding high in the south in the constellation Ophiuchus at magnitude 0.2 . **Mars** is hidden all month.

OTHER JULY EVENTS: During the last week of the month, you can see the Delta Aquariid meteor shower, and possibly some early Perseid meteors.
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FACTS ABOUT THE SOLAR ECLIPSE

Date and time: Monday, August 21, around 2:30 p.m (in North Carolina).

Region of North Carolina covered by totality: This will be a small region in the extreme southwest corner of the state, for example the towns of Murphy, and Franklin. In Murphy, totality will be at 2:34 p.m. and last 2 minutes, 26 seconds. It is a shorter distance for viewers from Winston Salem to go straight south, across the border into South Carolina. Greenville, SC, will have totality at 2:38 p.m., which will last 2 minutes, 14 seconds.

When does totality begin in the U.S.? Totality begins in the Northwest – on the Oregon coast at about 10:15 a.m. PDT. There, totality will last 1 minute, 58 seconds. The Moon’s shadow will move off the South Carolina coast at about 2:49 p.m. See the U.S. map in the June issue of the *Newsletter*.

How wide is the Moon’s shadow on the Earth? About 70 miles (112 km).

How fast does the shadow move? Nearly 2000 miles an hour.

What will be the greatest duration of the eclipse? This varies from place to place. The longest duration for 2017 will be near Carbondale, Illinois, and it will last 2 minutes, 40.2 seconds. The longest possible duration for a total eclipse is 7 minutes, 32 seconds. The next total eclipse in the U.S. will be in 2024.
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Astronomical Society website: <http://www.fas37.org>. **Kaleideum phone:** 336-767-6730 ext. 1000

For more solar eclipse information, go to www.eclipse2017.org/2017/faq.htm Bob Patsiga, editor