
YOUNG ASTRONOMERS NEWSLETTER

THE NUMBER OF SURVIVING APOLLO MOONWALKERS IS DWINDLING

Beginning with Apollo 11 in 1969, there were six Apollo Moon missions. Each consisted of a crew of three astronauts. Two crew members descended to the Moon's surface in the Moon Lander, while the third astronaut remained in lunar orbit in the Command Module.

That means there were twelve astronauts who set foot on the Moon during the Apollo program covering 1969 through 1972. Today, only four of the original twelve are alive. Just recently (May 26) Alan Bean (Apollo 12) passed away at the age of 86. Others who have recently died are: John Young (Apollo 16, age 87) died January 5, 2018; Richard "Dick" Gordon (Apollo 12, age 88) died on November 6, 2017; Eugene Cernan (Apollo 17, age 82) died January 16, 2017. Neil Armstrong, the first human to



**Alan Bean with American flag, on the Moon
Apollo 12 mission, Nov. 1969 (NASA photo)**

step on the Moon, died August 25, 2012.

Most of these space heroes continued to work in the aerospace industries after retirement. But Alan Bean took up painting and created a grand collection of space exploration scenes that depicted his experiences.

[\[www.nasa.gov/feature/alan-bean-apollo\]](http://www.nasa.gov/feature/alan-bean-apollo)

NEW HORIZONS WAKES UP AND GETS READY TO LOOK AT ULTIMA THULE

NASA, on June 4, awakened New Horizons from its 165 day hibernation period. The amazing spacecraft has sped beyond Pluto, which it visited in July of 2015, and is headed for another Kuiper Belt object nicknamed Ultima Thule (originally designated as 2014 MU69). The flyby is scheduled for New Year's Day, 2019.

At a distance of nearly 3.8 billion miles, the Mission Operations at Johns Hopkins Applied Physics Laboratory have initiated the wake-up sequence, updates, and science instrument check-outs. So far, all components are operating normally. At that distance, the one-way radio message takes five hours and 40 minutes. For those wanting to keep tabs on New Horizons' adventures, go to:

<http://pluto.jhuapl.edu/Mission/Where-is-New-Horizons/index.php>

CURIOSITY DISCOVERES ORGANIC MOLECULES ON MARS

On June 7, two papers appeared in the journal *Science* that give us some new information about the chemical, and possibly, biological past of Mars. The Curiosity rover has dug about 2 inches into mudstone in the basin of the Gale

Crater and discovered organic molecules. The study was conducted under the oversight of the Solar System Exploration Division at NASA's Goddard Space Flight Center. Gale Crater is believed to have once been a large lake.

The organic molecules so far identified all contain sulfur: thiophene, methylthiophenes, methanethiol and dimethylsulfide. Scientists believe that these molecules are fragments of larger molecules that were present on Mars billions of years ago. Investigators caution that these molecules by themselves are not evidence for ancient Martian life. There could be non-living processes that would have yielded identical molecules. The chemical analysis was done within Curiosity's chemical lab, by heating the ground up mudstone to over 800 degrees Celsius. The evolved gases were separated and then subjected to mass spectrometric analysis.

In a parallel analysis by Curiosity, it was discovered that Mars' atmosphere, though only one percent that of Earth, contains methane, CH₄, which, curiously, varies throughout the Martian year: increasing in the summer and decreasing during the winter. The concentration is at the parts per billion level. On Earth, methane is generated by microbial action (swamp mud, animal waste, etc.). Again, as in the organics described above, there may be non-living processes that generate this gas. Only further exploration missions can provide the answer. [nasa-mars-curiosity-rover-findings]

EINSTEIN'S GENERAL THEORY OF RELATIVITY TO BE TESTED NEAR THE CENTER OF THE MILKY WAY

Andrea Ghez, professor of physics and astronomy at UCLA, will follow the motion of a star that is very close to the black hole in the center of our Milky Way. This will be analogous to observing the shifting of Mercury's perihelion

(closest point to the Sun in its orbit) that was compared in 1915 to Einstein's prediction based on general relativity.

The star to be studied is designated as S2 and it is, by cosmic scales, quite close to the black hole, at about 9 billion miles distance. This causes S2 to zip around the center at between 1 and 2 percent the speed of light. The black hole, called Sagittarius A* has a mass that is several million times that of our Sun which causes a warp in the fabric of spacetime. These conditions should produce a far greater shift in the perihelion (actually, when the central object is not the Sun, it is called periapsis).

So, a comparison of the measured shift in the perihelion with what is predicted by general relativity will be a test for the theory.

In yet another test for relativity is a study by Tim Johannsen at the University of Waterloo in Canada. That group will use the Event Horizon Telescope (EHT) to observe the bending of light around Sagittarius A*. Sag A* will appear as a dark silhouette against a lighter background. The shape of the shadow should be nearly circular. If that is not observed, some adjustments to theory may be needed.

For over 100 years, Einstein's general theory of relativity has survived many careful tests. Will it continue to hold up? [Astronomy, July, 2018].

THE MILKY WAY DISK IS NOW BELIEVED TO BE TWICE THE SIZE OF ORIGINAL CLAIMS

Researchers at Instituto de Astrofisica de Canarias and National Observatories of Beijing have examined the spectra of over 4,600 stars located in the disk of the Milky Way. Distance measurement of these stars indicate that our galaxy's diameter is about 200,000 light years. This is twice what has previously been believed. Our neighbor galaxy, Andromeda, is still larger at 220,000 light years. [Astronomy.com, June 12, 2018].

BIRTHDAYS IN JULY

Georges Lemaitre (Belg.), b. July 17, 1894. d. June 20, 1966. Belgian priest and astrophysicist. One of the earliest to propose the Big Bang (he called it a nuclear origin of the universe). **Hans Bethe** (Ger.), b. July 2, 1906, d. March 5, 2005. (German, but spent most of his career at Cornell Univ.). Astrophysicist who was involved in working out nuclear synthesis in stars. **Jocelyn Bell Burnell**, (Brit) b. July 15, 1943. Discovered pulsars. Worked under the mentorship of Antony Hewish (see May issue). **Henrietta Swan 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. Dec. 25, 2016. Studied galaxy rotation rates. Proposed dark matter. Did graduate work with George Gamow. **Edward Charles Pickering** (Amer.) b. July 19, 1846; d. Feb. 3, 1919. At Harvard U. he recruited over 80 women to study photographs of astronomical bodies. This led to discoveries by Annie Jump Cannon and Henrietta Swan Leavitt (Cepheid Variables).

MOON PHASES IN JULY: Last Qtr.: Fri. the 6th; New: Fri. the 13th; First Qtr.: Thurs. the 19th; Full: Fri. the 27th.

THE PLANETS IN JULY: This month is for **Mars**. The red planet moves in close to the Sun around July 26 to 27 and is also in line with the Earth – Sun line, in what we call perihelic opposition. Perihelion is the closest Mars gets to the Sun during its elliptic orbit. Mars and Earth will be at closest approach on the 31st, a couple of days after the actual opposition. Those with backyard telescopes should be able to see Mars' southern polar cap. Mars' magnitude will swell to -2.8. Venus will be the only planet that is brighter. The red planet will be about 36 million miles from Earth. Compare that to the average Earth – Mars distance of 140 million miles. It will not be this close again until 2035. But remember: to the naked eye, it will still look like a red dot! Because it is in opposition, Mars will rise in the east just as the Sun sets in the west. The best time to view the planet will be later in the evening; even after midnight would be better. The problem though, is that there will also be a full moon on the 27th. While you're waiting for Mars, you can enjoy **Jupiter**, which is quite prominent (mag. -2.2) and high in the sky in the constellation Libra. **Venus** can't be missed in the west an hour or so after sunset. It's super bright with a magnitude of -4.2. You'll see it perched there most of the summer. Below Venus, and still in the glow of the setting Sun, look for **Mercury**. It will drop below the western horizon after midmonth.

As we trace the ecliptic from west to east, we begin with Mercury, then Venus, Jupiter is more or less straight up near the meridian, then more toward the east we see **Saturn** (it was in opposition in June) in the constellation Sagittarius, and finally the star of the show, Mars, not too far behind Saturn in Capricornus. This is a great summer to observe the five naked-eye visible planets. The reader may be surprised to learn that even the dwarf planet Pluto will be in opposition on July 12 (see special article in July's Sky and Telescope). But you will have to be very good at telescoping art to see it.

The **Delta Aquariids** meteor shower should peak in late July. But, alas, these weak meteors will be bleached out by the full Moon. Wait till next month and we'll look for the Perseids.

The FORSYTH ASTRONOMICAL SOCIETY meets on the second Wednesday of the month at Kaleideum North (formally SciWorks; 400 W. Hanes Mill Road). Visitors are welcome. To obtain information about FAS events, go the website: <http://www.fas37.org/> You can also try calling the front desk at Kaleideum about meetings or events: 336-767-6730 ext. 1000 Have a happy and safe 4th of July. Bob Patsiga, ed.
