
YOUNG ASTRONOMERS NEWSLETTER

VOYAGER-1 IS STILL RESPONDING

The Voyager-1 mission team had noticed that the spacecraft's attitude-correction thrusters were beginning to respond sluggishly. These thrusters are needed to keep the spacecraft oriented for optimum communication with Earth. As a back-up source of power for orientation control, it was decided to try to use the trajectory correction thrusters (TCM). These are used to adjust the craft's flight path. These four thrusters had not been used since 1980, thirty-seven years ago, when the spacecraft was passing Saturn. These thrusters were designed to burn continuously for long stretches. Attitude control would require only short bursts.

So, the mission team dug into decades-old programming notes to see if the software could be altered for the new objectives.

On November 28, a test firing was carried out and found to be successful. So, beginning in January, the Voyager-1 attitude maneuvers will be shared by the TCMs and the attitude-control thrusters.

The Voyager-1 and Voyager-2 spacecrafts were launched in 1977. Voyager-1 is now said to be in interstellar space, at a distance of 20.8 billion kilometers. One-way communication takes over 19 hours. Voyager-2 is trailing behind at a distance of 17.2 billion kilometers. [Space.com, Dec. 1, 2017].

BEHAVIOR OF ANTIMATTER

The January issue of Astronomy magazine lists the top stories of 2017, and one topic describes the successful measurement of emission lines coming from anti-hydrogen atoms.

As the reader likely knows, atoms of matter and antimatter cannot coexist in close proximity. When the two types of atoms come

together they annihilate each other with the release of high energy, such as gamma rays. Since we live in an environment of ordinary matter, we can't just latch on to a piece of antimatter to study. The stuff would just explode in our hands.

However, a team, called ALPHA, located at the CERN laboratory (the home of the Hadron Collider) has found a way to trap antihydrogen atoms and study them. This is done by mixing a plasma of antiprotons (have a negative charge) with positrons (positive electrons) and trapping the antihydrogen atoms in a bottle consisting of a magnetic force field. Thousands of antihydrogen atoms can be formed, but most have to be allowed to evaporate away in order to keep the remaining few sufficiently cool.

The ALPHA team then irradiated the trapped antihydrogens with a laser of proper wavelength to excite the antielectrons in the atoms to a higher energy state. When returning to their base state, the excited antielectrons release a spectrum, just like ordinary hydrogen atoms do, to give off emission lines.

It turns out that the antihydrogen emission spectrum is exactly the same as that from ordinary hydrogen. That is, the wavelength energies are identical, within experimental discernment. This is the first spectroscopic analysis of antimatter. The ALPHA team hopes to make other physical and chemical measurements as their techniques improve. [sciencealert.com; sciencedaily.com].

OLDEST GALAXY DISCOVERED

Astronomers have discovered what appears to be the oldest known spiral galaxy. A team of astronomers from Swinburne University in Australia and Princeton University, used the

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Gemini North (on Mauna Kea, Hawaii) telescope to find galaxy A1689B11, which dates back about 10.7 billion years. That's roughly just 3 billion years after the big bang.

The galaxy is a spiral galaxy, which is unusual since spiral galaxies are rare in the early universe. According to Hubble's galaxy sequence, spiral galaxies evolve by merging with elliptical galaxies. The outer arms of spiral galaxies are locations of new star formation. This newly discovered galaxy appears to be forming stars at about 20 times the rate of galaxies today. So A1689B11 may fit into an intermediate time period between early and mid-cosmic evolution. This type of galaxy has not been observed before.

The galaxy was observed by making use of gravitational lensing. This uses near-by large-mass objects, such as galaxy clusters and dark matter to bend light like a lens. The galaxy which was studied was located on the far side of intervening massive bodies, and the light curved around them to produce the magnification. [Science News, Dec. 9, 2017].

SPUTNIK 60 YEARS AGO

Sixty years ago, on October 4, 1957, the Soviet Union launched the first man-made object into orbit around Earth. It was called Sputnik 1. Its radio beeps heard for 21 days, stunned the world. This satellite was the first of a series of Sputniks. The second one, Sputnik 2, launched on November 3, 1957 carried a living passenger, the dog, Laika.

The Sputnik missions (sputnik is Russian for satellite) were ostensibly launched to contribute to earth science knowledge during the International Geophysical Year (IGY) lasting from 1957 to 1958. Sputnik 1 weighed 185 pounds and was about two feet in diameter. However, it carried no scientific instruments. Sputnik 3, launched on May 15, 1958, carried 12 instruments which studied solar-charged particles, electric and magnetic fields in space

and various other characteristics of the Earth's upper atmosphere. It showed that there are two radiation belts around the Earth. These charged bands were found to be the cause of auroras.

The Sputnik satellites created alarm among U.S. citizens and politicians. It was obvious that such an advanced state of rocket science could be applied to intercontinental ballistic missiles. President Eisenhower and congress responded by initiating new programs and agencies aimed to invigorate research and development of rocketry and space exploration. NASA was created, and the government put into place the National Defense Education Act. This pumped billions of dollars into math and science education.

The first orbiting satellite sent up by the United States was Explorer 1, launched on January 31, 1958. [American Scientist, Sept.-Oct, 2017; Wikipedia]

THE HUNT FOR EXO-MOONS AROUND EXO-PLANETS

There has become an international search for moons around exoplanets. The tally of exoplanets is now quite impressive; well over three thousand. However, up to now, no moon has been discovered around these distant worlds.

There is now increased interest in a large planet that orbits a young star in the constellation, Pictor, located in the southern hemisphere, 64 light years away. The star is cataloged as beta-Pictoris and the planet is named beta-Pictor b. Beta-Pic b is one of the few exoplanets that has actually been directly imaged by telescope. Both the star and its planet have extensive dust disks around them. Currently, the planet is making a transit of its star, which should last another two months, and astronomers are hoping that this will provide an opportunity to detect a moon. [Astronomy Jan. 2018 and Wikipedia]

BIRTHDAYS IN JANUARY:

Stephen Hawking (Brit.) b. Jan. 8, 1942, Cosmologist. Beginning of time and space, Big Bang Theory.

Robert Woodrow Wilson (Amer.) b. Jan. 10, 1936, radioastronomer. Co-discoverer of the cosmic microwave background. Nobel Prize 1978 (with Arno Penzias).

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MOON PHASES IN JANUARY: Full: Mon. 1/1 and Wed. 1/31. According to Native American traditions, the January full moon is called the Wolf Moon. The second full moon within a calendar month is sometimes called the "Blue Moon". This month, the second full moon is also special because it will give us a lunar eclipse. This lunar eclipse will be visible in the early morning at the U.S. west coast, but the setting moon will be too low for viewers in the east and south. The most we can expect is a brief penumbral eclipse right before the Moon dips below the western horizon. February of 2018 will not have a full moon. **Last Qtr.:** Mon. 1/8; **New Moon:** Tues. 1/16; **First Qtr.:** Wed. 1/24.

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QUADRANTID METEOR SHOWER: This, usually productive meteor show will be mostly washed out by the recent full moon. Peak for Quadrantids is to be January 3 – 4.

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THE PLANETS DURING JANUARY: Except for Venus, all of the naked-eye planets can be seen in the early morning sky. **Mercury** rises at the beginning of the month 30 minutes before sunrise, but it drops each day, and by the 20th it is obscured by the glow of the Sun. By the 13th, Mercury is joined by **Saturn** which rises earlier each day while the innermost world sags out of sight. But the ringed planet remains quite low throughout the month. **Mars** and **Jupiter** rise close together more than four hours before the Sun in the constellation Libra. (Jupiter is brighter of the two, Mars has a reddish coloration) On the 7th, the two planets are only 16 arcminutes apart. Four days later, on the 11th, the waning crescent Moon joins these two planets for a beautiful pre-dawn display. **Venus** is located on the far side of the Sun and remains out of sight all month.

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FAMOUS HISTORICAL ASTRONOMERS

Place a letter in the blank that best matches the historical person with his/her accomplishment.
(answers given below)

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|-----------------------|-----------------------------------------------------------------------|
| 1) Bell Burnell _____ | A. First European to propose heliocentric solar system (Sun centered) |
| 2) Cassini _____ | B. Established the magnitude scale |
| 3) Copernicus _____ | C. First to use a telescope to study the heavenly bodies. |
| 4) Einstein _____ | D. Discovered period-luminosity relation for Cepheid variable stars |
| 5) Galileo _____ | E. Proposed the big bang |
| 6) Hawking _____ | F. Formulated the three laws of planetary motion |
| 7) Hipparchus _____ | G. Discovered pulsars |
| 8. Hubble _____ | H. Stars convert mass into energy |
| 9. Kepler _____ | I. Discovered the gap in Saturn's rings |
| 10. Leavitt _____ | J. Discovered Earth's radiation belts |
| 11. Lemaitre _____ | K. Explained the big bang |
| 12. VanAllen _____ | L. Showed that the universe is expanding |

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HAPPY NEW YEAR!! Bob Patsiga, editor Forsyth Astron. Society website: <http://www.fas37.org>
Kaleideum (SciWorks) phone 336-767-6730, ext. 1000

1-G; 2-I; 3-A; 4-H; 5-C; 6-K; 7-B; 8-L; 9-F; 10-D; 11-E; 12-J
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