
YOUNG ASTRONOMERS NEWSLETTER

PROLONGED TIME IN SPACE CAUSES SIGNIFICANT CHANGES IN DNA

NASA has taken advantage of a unique opportunity in having a pair of identical twins in its corps of astronauts. Scott Kelly spent a year on the International Space Station while his twin brother, Mark lived his normal life on Earth. Certain biological markers in both brothers were tracked and thorough analysis of genetic and other factors was carried out.

Changes in body structure (Scott became 2 inches taller) were evident, but reversed to pre-mission level over a few days. However, there were significant changes in Scott's chromosome structure and gene expression.

Scott spent March 27 of 2015 to March 2 of 2016 on the ISS in an environment of microgravity. NASA and space scientists around the world were interested to learn the effects of prolonged weightlessness on the human body. Such information is of importance when considering long human missions, such as going to Mars.

At the genetic level, it was found that the end caps of Scott's chromosomes were elongated. These units, called telomers, are said to be bio-markers of aging. In an unusual twist, as Scott's telomers returned to normal size, some actually continued to reduce in length. Scientists are still trying to figure this out.

Tests on Scott showed a slight reduction in cognitive skills, which was not improving.

A study based on just one twin study is hardly statistically significant. Look for similar studies to be carried out by other foreign space agencies. [Astronomy, August 2019].

WHAT NEW HORIZONS FOUND AT ULTIMA THULE

New Horizons, the NASA probe that whizzed by Pluto in 2015 continued its exploration of the Kuiper Belt by taking a look at the tiny Kuiper Belt Object (KBO) Ultima Thule. This 20 – mile long double lobed object is located a billion miles beyond Pluto, some 4 billion miles from the Sun. New Horizons gave Ultima Thule a look-over last January first.

Ultima Thule is of interest to planetary scientists because it is believed to have existed several billion years, undisturbed since the time of formation of the solar system. Thus, what you see with Ultima Thule is likely what went into the formation of the Earth and our nearby planets.

Alan Stern, the team leader for the New Horizons mission gave a summary of their findings in the August Astronomy magazine.

The tiny and remote object has the systematic i.d. 2014 MU69. It consists of two lobes that appear to be fused together. Dr. Stern calls it a contact binary. It is speculated that two separate objects, one small and round, the other larger and flatter gently merged together.

There appears to be no atmosphere or frozen material, although there is some spectral signal due to water and methanol, most likely in a cold, condensed state attached to the surface. There are crater-like depressions as well as small rolling hills.

The prominent feature of the body is its color. It is quite red, as has been found to be the case with other similar Kuiper Belt objects. The red coloration is believed to be created from millions of years of cosmic radiation which breaks down what few organic molecules are present to produce fragments that gradually re-

Ultima Thule, cont.

form into a type of ill-defined gum called tholins.

The systems on New Horizons are still busy in downlinking data from the Ultima Thule flyby as well as making various environmental measurements as it continues on through the Kuiper Belt. Dr. Stern believes that the fuel on board (plutonium) is sufficient to power travel to at least one more KBO. This depends on funding from NASA.

MARGARET BURBIDGE, ONE OF THE AUTHORS OF HISTORIC PAPER ON SYNTHESIS OF THE ELEMENTS CELEBRATES 100 YEARS IN AUGUST

Eleanor Margaret Burbidge, a grand lady of astronomy will celebrate her centennial birthday on August 12. She, and three other astronomers published a landmark paper on how elements are synthesized in stars. This explains how the elements are created by sequential fusion reactions within the cores of stars.

In October, 1957, Margaret and husband, Geoff Burbidge plus two colleagues, William Fowler and Fred Hoyle published in "Reviews of Modern Physics" the historic paper: "Synthesis of Elements in Stars". This paper was so highly regarded and quoted, that it often has been abbreviated as the B²FH paper. It essentially explained how the elements in the universe were built up in stars beginning with hydrogen and helium, by a process we call nucleosynthesis, to give us the common elements that make up our bodies and our Earth.

Three pathways for element synthesis were proposed, some which occur within stars and some that occur during super nova star explosions.

Margaret was born in Davenport, U.K. and married physicist, Geoffrey Burbidge in 1948. They eventually began collaborating with William Fowler, an American nuclear physicist and astronomer Fred Hoyle on the problem of how the elements are synthesized in the cores of stars. Hoyle had already put out some papers related to elemental synthesis.

Margaret and Geoff eventually moved to the U.S. where they held various positions, including Mount Wilson (Geoff only), Yerkes Observatory, Caltech and University of California, San Diego.

Margaret received many awards and held a number of prestigious positions, such as director of the Royal Greenwich Observatory (first woman) and president of the American Astronomical Society (first woman) and president of the American Association for the Advancement of Science. Beyond the B²FH paper, she continued study of quasars and rotation and masses of galaxies.

She was an adamant supporter of women's equality in the sciences and created no small amount of friction if she felt there was sexual discrimination toward her female colleagues.

She became a U.S. citizen in 1977. Husband, Geoff died in 2010. [Sky & Tel., July, 2019].



Margaret Burbidge (Wikipedia photo)

