ASTROPHYSICS

Interstellar Deuterium Found

➤ DEUTERIUM—the heavy twin of hydrogen, which is by far the most abundant element in the universe—has been detected beyond earth for the first time.

The measurements were made from IMP-III, a satellite circling earth in a far-reaching "yo-yo" orbit. Scientists have for a long time been searching for evidence of deuterium outside the solar system, but until now they have found it only on earth.

The deuterium detected from the satellite measurements resulted from the collisions in space of high-energy cosmic rays with helium, which is the next most abundant element in the universe after hydrogen. All but about one percent of the mass of the Milky Way galaxy consists of hydrogen and helium and so, presumably, does the rest of the observable cosmos.

The cosmic-ray deuterium discovered by three University of Chicago scientists is only the third direct observation of this element in nature. The two other sources are hydrogen compounds on earth, mainly water, and meteorites.

Knowing the relative amounts of hydrogen and helium, or of either of these and deuterium, is essential to understanding the structure of the universe and how stars are born.

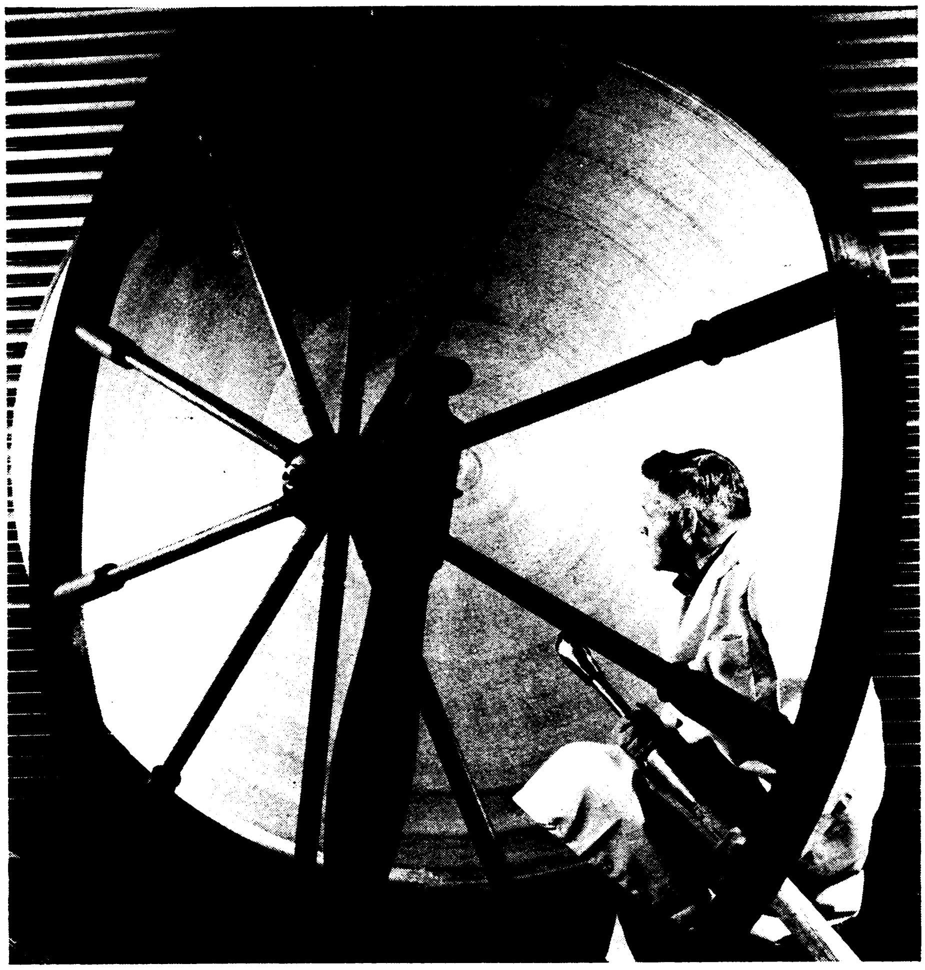
The IMP-III measurements were taken last year at a time when the sun was near the low point in its 11-year cycle of activity, thus allowing the scientists to be sure that the deuterium detected did not come from the sun.

Deuterium is the principal source of power for the hydrogen bomb.

Details of the deuterium detection by Drs. C. Y. Fan, George Gloekler and J. A. Simpson of the University of Chicago's Enrico Fermi Institute for Nuclear Studies are reported in Physical Review Letters, 68:323, 1966.

The Russians reported discovery of interstellar deuterium in 1955 from the radio waves it emits, but later rescinded the claim.

Not only was deuterium from the Milky Way galaxy found but also its energy spectrum was measured in the range of 17 to 63 million electron volts per nucleon. Since the observations were made far from earth—IMP-III has an apogee of some 150,000 miles—no corrections were required for matter above the detector or for geomagnetic effects.



Goodyear

SPACE-AGE SPINNING—Framed by an antique spinning wheel, this aluminum disk—and the technician in front of it—demonstrate a modern version of the ancient spinning technique. Finished product is a dish-shaped antenna reflector. Goodyear Aerospace is building the reflectors in Akron, Ohio, for Sperry Gyroscope Co., Great Neck, N.Y.

GEOPHYSICS

Earth's Make-Up Shown

➤ SAMPLES from the earth itself and from meteorites both show the same percentages of basic chemicals in earth's deep interior.

Remarkably good agreement about the earth's composition has been found from these two completely different sources by Dr. Brian Mason of the U.S. National Museum, part of the Smithsonian Institution. Meteorites are believed to contain the compounds from which earth and the other planets close to the sun were formed.

Since none of the materials below earth's crust can yet be examined directly, scientists rely on meteorites for clues as to what lies deep below this top layer, only some 25 miles deep.

Dr. Mason has used chondritic meteorites to calculate the chemical composition of earth's interior and of this planet as a whole. He then compared these estimates with those made by Drs. David Green and A. E. Ringwood of the Australian National University, Canberra, on the basis of the chemicals in two common earth rocks.

Dr. Mason found that although these two estimates were made from completely different basic data, they were sufficiently in agreement to show "the chemical composition of the inaccessible parts of our planet below the crust."

As he told SCIENCE SERVICE "Maybe now we are getting to know what earth is made of." Dr. Mason reported details in Nature, 211:616, 1966.

Drs. Green and Ringwood decided that the composition of earth's mantle could best be represented by a dunite-basalt mixture on the basis that this mixture would provide the basaltic magna so copiously injected into and through the earth's crust, leaving an upper mantle of dunite.