ASTRONOMY

Gas Between the Stars

Interstellar space filled with very sparse hydrogen gas. Although invisible, direct evidence has been obtained with radio telescope.

➤ THE SPACE between the stars is now definitely known to be filled with very sparse hydrogen gas. Invisible hydrogen gas, long believed to constitute most of the matter between the stars, has been detected physically. Small quantities of other gases undoubtedly exist there too, but hydrogen is the first gas to makes its presence known.

Radio telescopes within the past few months have successfully obtained direct evidence of energy emissions from these vast areas of invisible hydrogen gas, Dr. H. C. van de Hulst of Leiden Observatory, The Netherlands, and Dr. Harold I. Ewen of Harvard University told members of the American Astronomical Society meeting at the National Bureau of Standards in Washington.

Until now, hydrogen gas in interstellar space could be observed only in regions close to hot stars, which ionize the gas. With radio telescopes astronomers for the first time have observed hydrogen gas in the vast regions of space where it is neutral.

There is as much matter in the space between the stars as there is in all the stars together. Most of this matter is assumed to be neutral hydrogen gas. Thus for the first time man has observed the other half of matter contained in our galaxy. There is estimated to be about one atom of this free hydrogen in every cubic centimeter of space.

The manner in which this gas is distributed is fully as important as the distribution of stars. Further study is expected to give clues to the evolution of the system of stars to which we belong.

Our Milky Way galaxy is believed to resemble the Andromeda nebula, the only nebula easily seen with the unaided eye and visible these summer evenings, but actually we know less about its structure. We do not even know whether our galaxy has spiral arms, or how much of its mass is contained in the central nucleus. Exploration of invisible space with radio telescopes may help solve these problems.

Seven years ago, Dr. van de Hulst predicted that neutral hydrogen in interstellar space ought to emit energy of 21 centimeters wavelength, which could be picked up with delicate radio equipment. His radio astronomy research group in Holland during the last two years has attempted to observe this atomic radiation from the Milky Way, making this its chief project.

During Dr. van de Hulst's stay at Harvard Observatory this spring, he collaborated with Drs. Ewen and E. M. Purcell, also of Harvard. Less than three months ago, on March 25, Dr. Ewen first observed the 21-centimeter hydrogen radiation from the sky with a horn-shaped antenna on top of the Physics Laboratory at Harvard. Six weeks later, C. A. Muller confirmed the discovery in Holland, using an antenna with a higher resolving power.

The neutral hydrogen atom consists of a nucleus with one electron circling it. However, in addition to circling the nucleus, the electron itself is spinning. Dr. van de Hulst calculates that on the average the electron spin in an atom, not otherwise affected, will by some chance process be reversed about every 11,000,000 years. It is the energy released by this reversal of countless hydrogen atoms in space that is detected with the 21-centimeter radio receiver.

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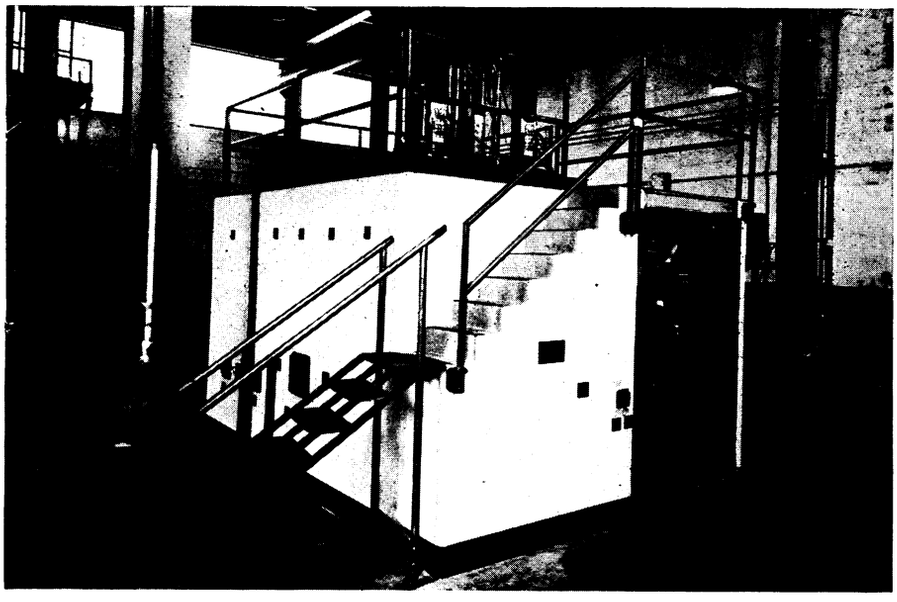

"CLEMENTINE"—The Los Alamos Scientific Laboratory's fast reactor, showing some of its details for the first time, is pictured above. Closet on the right holds equipment for circulating the mercury coolant. A metal door shields this machinery during operation.

● RADIO

Saturday, July 7, 1951, 3:15-3:30 p. m. EDT

"Adventures in Science," with Watson Davis, director of Science Service, over Columbia Broadcasting System.

Wayne Taylor, director of the Traveling Workshop, Texas State College for Women; Mrs. Lois Walker, supervisor of Lufkin High Schools, Lufkin, Texas; Mrs. Lillie Duncan, elementary teacher in Hamilton, Texas, will discuss "Traveling Workshop for Teachers."

PHYSICS

Disclose Telegram Gave Name to "Clementine"

➤ HOW "CLEMENTINE," the only known reactor that uses plutonium for fuel and liquid metal for cooling, got that name was disclosed by the Atomic Energy Commission.

The fast reactor was so named by a scientist who had helped to make plans for it at the Los Alamos Laboratory, Los Alamos, N. M., where the atomic pile is located, then left. But he still wanted to know how the work was going on.

All the work was classified, so this was the telegram he sent:

"In a cavern, in a canyon, extrapolating must be fine.
Since you're the miners, 49ers, tell me how is Clementine,"

Since the reactor was being built in a canyon, and 49 was the code name for plutonium, the reactor crew had no trouble in translating his query. And Clementine was promptly adopted as the name for the reactor.

Heart of the machine is a bundle of plutonium rods arranged in a lattice. Around this bundle is a neutron reflecting material used to prevent neutrons from escaping, and outside of the reflector is a neutron and gamma shield.

Science News Letter, June 30, 1951