

ASTRONOMY

Destruction of Anti-Matter

Clashes of matter with anti-matter, annihilating both, might be cause of radio waves broadcast by heavenly sources, two astronomers speculate.

► CLASHES of matter with anti-matter destroying both, could cause the broadcasting of radio waves from space picked up on earth by the giant antennas called radio telescopes.

This speculation on the origin of some of the mysterious signals from the depths of the universe was presented to the American Astronomical Society meeting in Berkeley by Dr. G. R. Burbidge of Mt. Wilson and Palomar Observatories, Pasadena, Calif., and Prof. Fred Hoyle of St. John's College, Cambridge, England, who has been working in Pasadena.

The Burbidge-Hoyle paper was read by D. E. Osterbrock, also of Mt. Wilson and Palomar, since the scientists are in Europe.

Discovery of the anti-proton last fall strengthens suggestions that matter is symmetrical, or evenly matched; that for every fundamental particle of positive matter, there exists a negatively charged counterpart, such as anti-protons and positrons.

Investigating the possibility of anti-stars and anti-galaxies, Drs. Burbidge and Hoyle find that the most anti-matter that could be present in the Milky Way galaxy is one part in 10,000,000.

They calculated this from the known motions of the interstellar gas clouds in the Milky Way, the giant cluster of billions of stars of which the sun, with its planets including earth, are a part.

Assuming that this one part in 10,000,000 of anti-matter does exist, Drs. Burbidge and Hoyle find that its annihilation when colliding with normal matter provides an energy supply for the known sources of radio waves in the Milky Way.

The current theory concerning radio waves from cosmic sources holds that large fluxes, or streams, of electrons and positrons, such as would be created in the destruction of matter and anti-matter, moving in interstellar magnetic fields, are responsible for the radio emission.

Drs. Burbidge and Hoyle conclude that, for a number of sources, both in the Milky Way and far-distant galaxies radiating as a whole, the intensities of radio waves received on earth can be quantitatively explained by their theory of the existence of anti-matter on a cosmic scale.

Present methods of optical astronomy, they say, would not show whether the material of the universe is distributed evenly between the positive and negative forms.

Although any anti-matter formed at the creation of the universe "would have long ago disappeared," Drs. Burbidge and Hoyle suggest that anti-matter is being continuously formed in the vast, cold regions of interstellar and intergalactic space, at a rate

equal to that at which normal matter is formed.

Under these conditions, a steady state is maintained. The addition of anti-atoms is balanced by their rate of annihilation, and the electrons produced by the destruction lose their energy by contributing to the random motions of interstellar clouds.

Radio astronomers may actually be hearing the hisses of one galaxy clashing with an anti-galaxy or a cloud of anti-gas when they train their radio telescopes on a strong source in the constellation of Cygnus, the swan. Although this speculation "borders on fantasy," if true, the reaction would stop itself when only about a ten-thousandth the mass of a typical galaxy had been annihilated. Pressure exerted by the electrons through the magnetic field they create, and also possibly by colliding atoms, would be sufficient to explode the colliding gases, thus slowing down and stopping the annihilation.

"The presence of anti-matter on a large scale cannot be ruled out as a cosmological speculation," Drs. Burbidge and Hoyle agree. Even the electrons resulting from the annihilation, they pointed out, would probably remain unobservable under the conditions occurring in the space between galaxies.

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TECHNOLOGY

Details Revealed on Powerful Sea Radar

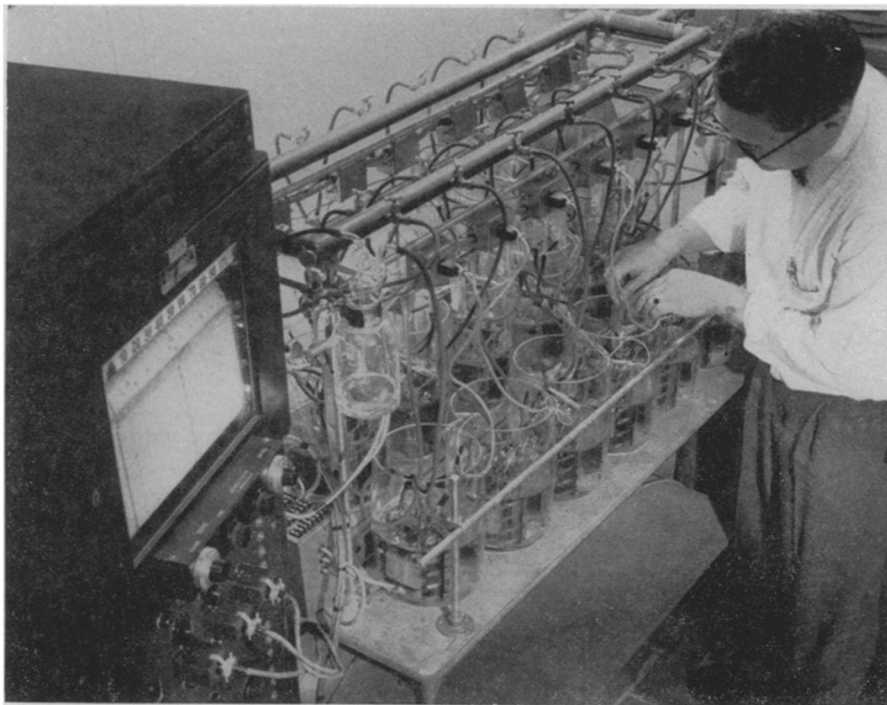
► THE MOST POWERFUL RADAR set afloat spots planes 400 miles away. The shipborne "seeing eye" is installed aboard the cruiser Northampton.

Heart of the set is an electronic tube known as a magnetron, nicknamed "Big Maggie." At peak power, the tube delivers over 10,000,000 watts, or enough power to take care of the electrical needs of a city of 25,000 people.

The tube's core is a cathode that operates at temperatures up to 3,100 degrees Fahrenheit, or hotter than molten iron. Development of the tube also resulted in breaking through the "sparking barrier," pushing it to a level ten times higher than previously.

The radar set was designed and developed by engineers at Westinghouse Electric Corporation, Elmira, N. Y.

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ELECTRICITY FROM GASES—The fuel cell is a device to obtain electricity from gases such as oxygen and hydrogen, which serve as positive and negative "poles," respectively. Here Dr. John Yeager at the research laboratories of National Carbon Company in Parma, Ohio, a division of Union Carbide and Carbon Corporation, is testing the oxygen, or positive, side of an array of these new and still experimental batteries. One of the aims of the research program is the development of improved fuel-cell carbon elements to last for long periods under relatively high and intense currents.