

new experiments can at least show the effects of this tiny ghostly particle.

As a "ghost" the neutrino is no malevolent entity. Rather it serves lawabiding physicists in their studies of nature and helps them to avoid breaking the laws of the conservation of momentum in interpreting their atom-smashing experiments.

Drs. H. R. Crane and J. Halpern of the University of Michigan described one such experiment that would controvert the momentum laws unless the neutrino is present.

The scientists studied the spontaneous disintegration of the element chlorine having atomic mass 38. Visible in their apparatus was the track of the electron emitted by the atom in the disintegration and also the track of the recoiling atom.

On an atomic scale the experiment is somewhat like a man standing on a slippery sheet of ice holding in his hand a heavy ball. As he throws out the ball (corresponding to the emission of the electron) he slips backward a bit (the recoil of the atom).

The laws of the conservation of momentum can be used to calculate the energies and momenta for the man and the ball. But for the case of the chlorine the laws and experiment are not in agreement. There is a loss of momentum in the process which does not show up in the experiment.

Scientists can either throw overboard their time-tried law of momentum conservation or they can postulate the existence of a neutrino particle. Naturally they choose the latter alternative.

The neutrino particle, as postulated, has the mass of the electron but is without an electrical charge which makes it non-ionizing (undetectable) as it passes through the instruments.

The new work of Drs. Crane and Halpern is accurate enough so that they can calculate the direction in which the neutrino particle must come off.

Detects Minute Current

THE MOST sensitive current-detecting device ever developed by science was also described to the Society. Dr. James S. Allen of the University of Minnesota told of a vacuum tube which will measure the minute amount of electricity carried by a single electron passing down a wire every five minutes. This corresponds to a current of 0.000,000,000,000,000,000,001 amperes. The best previous current detector measures, in comparison, 20 electrons a second. Thus the field of sensitivity has been pushed back 6,000 times by the new device.

The two-inch diameter vacuum tube—a modern Aladdin's lamp—is the product of research in television, Dr. Allen indicated.

Standing eight inches tall, it contains a number of beryllium-covered plates arranged much like steps of a ladder. A single atomic bullet falling on the first step knocks out about ten electrons. These secondary electrons speed toward the second step and each one of them knocks out about ten more, and so on for each "step."

The tube is extremely useful in atomic bombardment researches with weak energies. Previously it was necessary for the atomic fragment to tear off electrons from several thousand atoms in its path to make a current that could be recorded. Now the fragment needs to have only the energy to reach the first beryllium step in the tube.

It is possible to attach the new tube directly to a larger vacuum chamber in which atomic disintegrations are occurring so that the fragments come to the first stage of the tube without passing through intervening matter as is the case with the Geiger counter tubes, commonly used for this type of research.

Thin Film Reflections

PROGRESS in the art of depositing thin films on glass to change the original reflection characteristics was reported by Drs. C. Hawley Cartwright and A. Francis Turner of Massachusetts Institute of Technology.

While originally the M.I.T. scientists described ways of producing almost a complete absence of reflection from glass surfaces by the use of films, their new findings show ways to produce extra high reflections. They do this by depositing alternate layers of materials having high and low indices of refraction.

With such a system they are able to increase the reflecting power by 80 per cent. for any pre-selected wavelength of light.

By choosing film thicknesses suitably they have developed a color filter which will reflect 85 per cent. of the green light and transmit 90 per cent. of the red.

Lightning Speed Found

NEW discoveries showing that lightning strokes travel at 1,000,000,000 centimeters a second (at a rate of more than 22,000,000 miles an hour) were described by J. M. Meek of the University of California.

Initial act of a lightning discharge is

to create a "pilot" streamer of comparatively low velocity which, nevertheless, speeds along at 20,000,000 centimeters a second. The electrical current in this pilot streamer, the California physicist indicated, is about one-tenth of an ampere. Diameter of the streamer is about one-eighth of an inch.

In a cubic centimeter of its "tip" there are 100,000,000,000 ions present, it is estimated.

The later discharge, known as the step leader, has the much higher velocity of 1,000,000,000 centimeters a second.

Science News Letter, May 13, 1939

PSYCHOLOGY—SOCIOLOGY

Keeping Father From Baby May Make Families Small

SHUTTING out anxious fathers from the nursery of their newborn babies may be a significant factor in reducing the birthrate, physicians of the New York Academy of Medicine learned from Frederick Osborn, research associate in anthropology of the American Museum of Natural History.

"Students of population increasingly suspect," said Mr. Osborn, "that the attitude of the father often determines ultimate size of family. Does the doctor have this in mind, and do everything possible to bring the father into an intimate relation with the thrilling and beautiful aspects of bringing a new life into the world? Or is the father excluded at the start, and then brought to think of this only as a period of anxiety and painful separation?"

European peoples appear headed for a serious decline following a period of unprecedented numerical increase, Mr. Osborn told the physicians.

Between 1650 and 1933, peoples of European descent increased their numbers sevenfold from 100,000,000 to 700,000,000 while the human race as a whole increased fourfold from 500,000,000 to something over 2,000,000,000.

During this time, however, unnoticed forces were working toward a reversal of the trends. For a hundred years births per married woman had declined.

The physician's advice to parents and his attitude in the matter of family size may be influential in preventing further limitation of families of competent persons, Mr. Osborn indicated.

"The sterility of those who are most affected by the modern civilization in this country and abroad is not a physiological sterility," he said. "It is an emotional sterility, of which birth control is only the tool."

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