PHYSICS

European Scientists Study Neutron, Latest Atomic Part

Not Known Whether New Physical Concept, Combination of Electron and Proton, Is Material Particle or Radiation

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LEADING physicists in Europe are making investigations to detect the neutron, latest of the atomic parts to be revealed by science.

The negatively charged electron and the positively charged proton have been known and measured for years. But the neutron, supposed to be a close combination of the electron and the proton, is just now receiving experimental support. It has no detectable electric charge and leaves no finger-prints in the form of ionized or electrified particles to mark its passage in a gas.

"It is not certain at present whether we are dealing with material particles or with radiation." le duc Maurice de Broglie said to me. He is a member of the French Academy of Science and one of France's foremost physicists. He continued:

"The facts so far known about the peculiar rays whose nature is being investigated, do not agree completely either with the 'quantum' or with the 'neutron' hypothesis. It is difficult to devise crucial tests that will distinguish between them. If it could be shown that the rays are even very slightly affected by an electro-magnetic field, that would definitely prove their material nature, because quanta could not be so affected."

Prof. W. Bothe of Giessen, Germany, first obtained these powerful rays by bombarding beryllium with the alpha rays of polonium. This alpha radiation really consists of helium nuclei, that is, positively charged material particles. Prof. Bothe thought that the powerful secondary rays thus obtained were "quanta" of radiation, super-gamma rays approaching cosmic rays in energy, and similar to radio or light waves, only much shorter. He ascribed them to the transmutation of beryllium nuclei of weight nine into carbon nuclei of weight thirteen by the capture of alpha rays, which are helium nuclei of weight four.

Later Mme. Curie-Joliot and Monsieur F. Joliot of the Curie Institute of Paris showed that when the secondary beryllium rays strike hydrogen-containing substances, they again produce positively charged particles with very high energy, an effect which is not readily compatible with the view that the secondary beryllium rays are quanta, that is, electro-magnetic radiation, like gamma rays.

Immediately after, Dr. J. Chadwick of the Cavendish Laboratory of the University of Cambridge, England, as a result of similar experiments, put forward the view that the mysterious beryllium rays are the long-searched-for neutrons. According to his hypothesis, when the beryllium nucleus captures an alpha-particle, it adds only three units to its weight, transforming itself into carbon of atomic weight twelve. The extra unit of "matter" becomes a neutron consisting of a proton of mass one, together with an electron of negligible mass. The two are supposed to be closely bound together—not with the electron revolving in a relatively large orbit, as happens within the atom of hydrogen.

Dr. Chadwick had been led to assume the transformation of beryllium nine into carbon twelve in order to account for the enormous energy of the recoil protons produced from the nitrogen atoms struck by the rays, which can produce some 30,000 ions and have therefore an energy of about 52 million volts.

The positively charged protons can be detected in two ways: either by causing water vapor to condense along their path, or by detecting, after enormous amplification, the minute electric current produced in a special ionization chamber by the passage of the proton. This second method has been used in de Broglie's laboratory in Paris by L. Leprince-Ringuet.

Other experiments on boron and fluorine atoms, made by Dr. H. C. Webster of the University of Bristol, seem to support the neutron interpretation, but scientists are eagerly awaiting new developments. Monsieur and Mme. Curie-Joliot are planning to carry out experiments on the Jungfrau to determine the relation of the presumed neutrons to the cosmic rays.

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EMBRYOLOGY

Monkey Colony Opens New Era In Embryological Research

THE ESTABLISHMENT of a monkey colony in which scientists can study every stage in the development of the animal from the formation of the egg to the birth of the baby monkey, has opened a new era in the science of embryology, said Dr. George L. Streeter, of the department of embryology of the Carnegie Institution of Washington at the meeting of the American Association of Anatomists in New York.

From his study of these monkeys, Dr. Streeter found that the maternal body prepares a special place for the fertilized egg to attach itself where the embryo may subsequently obtain nourishment and dispose of its waste products.

This discovery clears up a point which has never been exactly understood by scientists before this, either in the case of monkeys or of human beings, Dr. Streeter explained. Scientists knew that once the egg was attached to the maternal tissues, the growing embryo was able to get nourishment from them, but no one knew whether the arrangements for the exchange of food and waste products were made entirely by the new little organism or by its parent. Now Dr. Streeter has found that there is preparation on both sides.

He was able to make this discovery as a result of earlier studies on monkeys by Dr. Carl G. Hartman of the Carnegie Institution. Because monkeys are so small, Dr. Hartman can tell by manual examination just when the egg leaves the monkey's ovary and when it reaches the womb. He knows at just what stage the egg becomes fertilized. By applying