

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 Mon-

sieur 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-sought-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, to-

gether 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

this knowledge, Dr. Streeter made his discovery that the maternal tissues begin preparations for the fertilized egg before it attaches itself to them.

These preparations consist in forming a marshy place on the interior surface of the uterus or womb. Into this marsh-like tissue, which is kept bathed in blood, the developing embryo shoots little stems called villi which are filled with blood vessels. The blood in these vessels never mixes with the maternal blood, but nourishment and waste materials are exchanged between them by means of gases and soluble material, Dr. Streeter explained.

Study of this process of attachment of the fertilized egg to the maternal tissues and the maternal preparations for it, may shed light on the causes of sterility, of abnormal developments resulting in monsters, and of abortions, Dr. Streeter pointed out. He said that his discovery rested not only on Dr. Hartman's work with monkey eggs, but on the skill in handling the tiny eggs and embryos developed by Dr. Chester H. Heuser of the Carnegie Institution.

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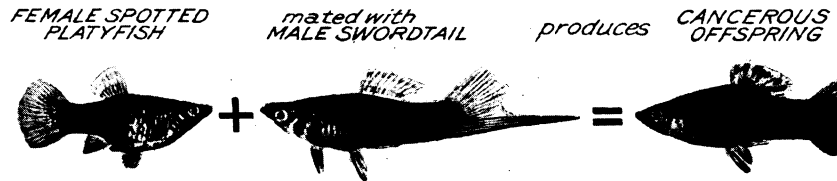
Goldfish Experiments May Explain Cause of Obesity

GOLDFISH used in experiments at the California State Prison may shed new light on the cause and treatment of obesity. The effect of diet on the weight of these ornamental animals was investigated by Dr. Leo L. Stanley and Gordon L. Tescher of the prison's medical department and reported to *Endocrinology*.

These investigators studied four goldfish. Two of the fish were fed beef muscle and the other two were fed an equal amount by weight of ground-up glandular substance from the reproductive glands of a ram. The ones getting the beef muscle gained more weight than those getting glandular substance.

From previous experiments the investigators knew that the glandular substance increased the activity of the fish. They assumed that the two diets, beef muscle and glandular substance, were equally adequate as food. Consequently they concluded that the glandular substance increased the energy interchange in the fish bodies as well as the activity and thus kept down the weight of the fish. They pointed out in their report that this may have a bearing on the cause and treatment of obesity.

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BIOLOGY

Cancerous Fish Object of Scientific Quest in Mexico

ONE of the oddest scientific quests ever undertaken is that of Dr. Myron Gordon of Cornell University into Mexico, looking for cancerous fish.

Dr. Gordon, with two youths as assistants, is now en route to the state of Oaxaca, in the far south of Mexico, in an endeavor to establish that a fish cancer called melanosis actually occurs in nature.

He has produced the tumor unflinchingly in the laboratory, by cross-breeding certain species of Mexican killifish, but science has yet to learn if the fish mate in their natural environment in such a way as to produce the disease.

Dr. Gordon's experiments over a period of more than three years give definite indication that melanotic tumor, a disease similar to cancer in human beings, is the result of heredity.

This does not mean that a diseased fish will transmit the cancer to its offspring. Rather the conclusion is that if two healthy fish of certain species are mated, the offspring will die of cancer. The application which this discovery might have to human cancer is far-reaching.

Most Likely Spot

Dr. Gordon has chosen Oaxaca as his destination because it is the one spot in the world most likely to produce cancerous killifish. The fish he crosses to produce the disease in the laboratory are swordtails and spotted platyfish, tiny ornamental creatures that are competing with goldfish for public favor. In nature, so far as he knows, the only location where these two varieties inhabit the same waters is in Oaxaca, and he wishes to learn if they mate there naturally.

Black pigment cells, showing up as black splotches in the fish's skin, are requisite to the disease. It develops ex-

actly as human cancer does, growing as a tumor until parts begin to slough off and the fish eventually dies.

Dr. Gordon emphasizes that he has found no cure for cancer, nor is he seeking one; he is a zoologist, not a physician. What he is after are the fundamental biological facts which underlie the development of cancer.

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MEDICINE

Tourniquet Held Cause Of Shock and Gangrene

THE TOURNIQUET, bound tightly around the arm or leg to stop bleeding, is no longer considered good practice in first aid, it appears from an editorial note in *The Lancet*. The danger of too prolonged pressure with this instrument was emphasized and the tourniquet itself was referred to as "a disreputable relic of the past whose only habitat should be the museum."

For seven years a Belgian physician, Dr. M. Stassen, has dispensed with the tourniquet in the first-aid equipments for which he has been responsible, *The Lancet* pointed out. During that time several hundred cases of compound fractures of the limbs, in which the skin as well as the bones are broken, have been brought to his hospital from points nearly 40 miles away. Not a single death from hemorrhage during transport occurred.

Dr. Stassen thinks the tourniquet is a frequent cause of shock and gas gangrene. By completely stopping the blood circulation in the injured limb, it promotes infection in the crushed and torn tissues. Its removal is followed by absorption of poisons capable of killing a patient already weakened by cold, shock, and loss of blood.

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