SCIENCE NEWS

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NEUTRONS

THE neutron, the physical concept brought into prominence by research reported by Professor James Chadwick, of the Cavendish Laboratory, Cambridge, England, is a close combination of two other more familiar parts of the atomic structure, the electron and the proton. The electron is the negative particle or unit of matter and electricity, while the proton is the unit of positive charge. The neutron, being a combination, has no charge at all.

Therefore, physicists delving into the constitution of matter have considered that it would be very difficult to prove that it actually exists. The neutron would pass through ordinary matter without having any magnetic or electrical effects, but a theoretical possibility formerly suggested for its physical detection would be through the gravitational effect of the neutron upon passing close to some atomic heart or nucleus.

While the idea of an electron and a proton combining to form a neutral particle that might play a part in the structure of matter is probably some fifty years old, the idea of the neutron was put forward formally as an "attractive speculation" by Drs. R. M. Langer and N. Rosen, of the Massachusetts Institute of Technology, in a communication to *The Physical Review* of the American Physical Society on June 15, 1931. Professor W. Pauli, of the Institute of Technology, at Zurich, Switzerland, also suggested the usefulness of the neutron when he spoke before the American Physical Society, at Pasadena, California, last June. He suggested the neutron might explain some fine structure in the spectra of elements.

The neutron may be the solution of the mystery of the cosmic ray. Since physicists began to study these extremely penetrating radiations from outer space there has been difference of opinion as to whether they are electromagnetic waves like light and x-rays or streams of electrons, the negative particles of electricity. Professor Chadwick's researches just reported from England may give evidence that they are neither, but that they are instead streams of neutrons. This would fit the experimental facts of other investigators here and abroad that show that cosmic rays can not be deflected by magnetic fields as electrons should be, and yet do not wholly fit the character of an electromagnetic vibration.

Neutrons may prove also to be a new building block of the elements. The helium nucleus, also called the alpha particle, is now considered a fundamental brick for element building. It consists of four protons and two electrons and has a positive charge of two. The helium atom is itself built of four hydrogen atoms, which each consist of a proton with an electron revolving about it like a planet around the sun.

American physicists will await with interest Professor Chadwick's scientific report of his experiments. It may prove that the neutron is formed during the artificial disintegration of matter, such as has been accomplished by Professor W. Bothe, of Giessen, Germany.

NEW PHOTOGRAPHIC PLATES

NEW photographic plates that take pictures in the dark and have to be kept packed in ice until used promise to usher in a new era of photography and spectroscopy. To the Optical Society of America, meeting at Cambridge, Massachusetts, Dr. C. E. Kenneth Mees, of the Eastman Kodak Company, demonstrated the results of using a new dye discovered at his laboratories for sensitizing plates to infra-red radiation, the invisible light that is longer than can be seen by the eye. A photograph of a flatiron taken in the dark with its own heat rays was exhibited.

More important to science was the report of Drs. W. F. Meggers, C. C. Kiess and C. J. Humphreys, of the U. S. Bureau of Standards, who, using the new plates, discovered many new spectroscopic lines of 36 chemical elements. These new "flags" of the elements were found in the region of the spectrum lying between wavelengths of 9,000 and 11,200 Ångstrom units. The plates sensitized with the new dye record a wide band of invisible heat "light" from 8,000 to beyond 11,000 Ångstroms, with a maximum at 9,600 Ångstroms.

Not only do the new infra-red sensitive plates "see" farther into the infra-red than ever before, but they have a speed a hundred to a thousand times that of the best plates that have ever been made before for the infra-red region.

Use of the new plates is expected to extend the knowledge of the elements greatly. Physicists at the Bureau of Standards state that the Eastman Research Laboratories, discovery "is recognized as beginning a new era in infra-red spectroscopy."

The new plates have allowed astronomers to discover iron lines in the stars that are known as B and F stars. It is possible that important new astronomical discoveries will be forthcoming as soon as the new plates are used as ammunition in the large photographic telescopes of America. They may see stellar bodies that human eyes and ordinary photographic plates can not detect.

The name of the new dye used to sensitize the plates is zenocyanine. It is much more sensitive and reveals more of the spectrum than dicyanine, which held first place among infra-red sensitizers for a decade, or neocyanine, which was discovered in 1926. The dye must be synthesized just before use and the plates must be kept in cold storage or packed in ice as just the heat from the sides of an ordinary container at room temperature will fog the plates.

ELECTRON PARTICLES AS WAVES

REPETITION by a modified method of the epoch-making experiments which first proved that electrons can behave as waves, was reported to the American Physical Society

on February 25 by Drs. C. J. Davisson and L. H. Germer, of the Bell Telephone Laboratories, New York.

A stream of electrons moving at high speeds was directed at a nearly glancing angle towards an etched metal surface, and caught on a photographic plate where the diffraction rings formed showed that the electrons behaved like light waves. Previously untried metals and a new method devised by Professor G. P. Thomson, of the Imperial College of Science and Technology in London, were used in the recent experiments. Patterns of about twenty rings were obtained in the new experiments of Drs. Davisson and Germer from the metals gold, tungsten, molybdenum, cobalt, nickel, chromium and platinum. The arrangement of the rings was characteristic of the known structure of the metals.

For some metals, etching with acid or standing in the air caused a change in the pattern. A narrow pencil of light rays directed at a fine grating or a pencil of x-rays hitting a crystal surface produce similar "diffraction" patterns because of their wave-like nature.

BLOCKS OF ATOMS

DR. FRANCIS BITTER, of the Westinghouse Research Laboratories, has established for the first time, through magnetic researches, that the matter that seems to ordinary eyes so solid and unbroken is actually made of blocks, somewhat like a tile floor, each block made of several million atoms. Reporting to the American Physical Society, at Cambridge, Massachusetts, Dr. Bitter described his experiments that upheld the previous theory that contends such block structure in solids exists.

A magnetic powder was suspended by Dr. Bitter in a liquid which was allowed to evaporate on a shiny surface of the metal cobalt. As the liquid evaporated a regular lace-work appearance was produced by the grouping of the particles. As these deposits were arranged in the form of hexagons, Dr. Bitter concluded that the blocks of the metal itself had just this hexagonal arrangement.

Magnetization of the cobalt specimen changed the pattern to a series of not quite parallel lines, showing that the blocks had become differently arranged under the influence of the magnetic force. Irregularities in the pattern were produced, Dr. Bitter believes, by impurities in the metal. This brick or mosaic structure provides the key to some of the most baffling problems about the strength and electrical resistance of solids.

Dr. Bitter's discovery was not accidental but followed logically from a long series of theoretical investigations in which he studied what would be the consequences of such a block structure in solids.

Dr. Bitter is the son of Karl Bitter, internationally famous sculptor.

HOW INFANTILE PARALYSIS ATTACKS ITS VICTIMS

A THEORY of how infantile paralysis attacks its victims has been applied to the disease as it occurs in man by Dr. Harold K. Faber, of the Stanford University Medical School. This theory is based partly on experimental work by two British investigators, Fairbrother and Hurst.

The germ of the disease, Dr. Faber believes, does not reach the nervous system through the blood or lymphatics, but directly through the nose without any preliminary attack on the rest of the body. Dr. Faber disagrees with other clinical authorities who believe that in this disease there is a preliminary stage when the germ is in the blood or directing its attack on the body generally before spreading to the nervous system where it produces its damaging effects.

Dr. Faber studied the histories of over 100 cases of this disease. He found that the most frequent and characteristic symptoms at the onset, considered by themselves and in their observed combinations, were either obviously of a nervous order or strongly suggestive of nervous disturbance, and none was incompatible with a nervous origin. They were fever; vomiting; drowsiness, restlessness and irritability; headache; pain or excessive sensitiveness; awareness of bodily disturbance or vague symptoms of discomfort.

These same symptoms, together with others showing a spread in the injury to the nerves, are almost equally characteristic of the later stages of the disease, he points out.

Another point supporting his theory is the fact that the permanent damage to the nerves and the resulting paralysis are confined to one side of the body in more than three fourths of the cases. If the germ first invaded the blood stream and then spread to the nerves, the paralysis and nerve damage could be expected to be scattered evenly over both sides of the body.

Furthermore, students of the disease have found it very difficult, almost impossible, to produce infantile paralysis in apes by injecting the virus or germ causing it directly into the veins, while it has been comparatively easy to produce it only by applying the germ directly to nervous tissue through injections into the spinal cord or brain. This is another reason why Dr. Faber thinks the virus must attack the nervous system directly when it produces the disease in man.

THE USE OF FIRES IN PINE FORESTS

SALVATION of the valuable long-leaf pine, which once stretched in virgin stand from Virginia across the South to east Texas, lies in the use of what is commonly regarded as the arch enemy of all timber—fire.

This is a conclusion reached by S. W. Greene, representative of the Bureau of Animal Industry at the Coastal Plains Experiment Station at McNeill, Mississippi.

Fire, Mr. Greene states, burns up the grass which promotes spreading of brown spot disease, Nemesis of the pine seedlings. Fire stops the growth of hardwoods and less desirable species of pine, which suppress the long-leaf variety. Fire cleans out the underbrush and encourages the growth of legumes which enrich the soil and make it better ranging land for cattle and quail.

Mr. Greene advances these arguments, heretical in the

opinion of many foresters, in a report to the American Forestry Association.

The long-leaf pine, he states, has a peculiar habit of growth. Instead of shooting up a stem as soon as it germinates, it forms a bundle of leaves in the grass and for several years builds a root system and stores reserve food there. If fire causes it to shed its needles, it merely calls on the root food to form a new set, and keeps on growing. Other pines, however, spend their energy the first year in building a stem, and are easy prey of smoke and flame.

Fires, Mr. Greene says, can be used to keep the pine-needles and other light fuel cleaned up and thus prevent the accumulation of a serious fire hazard. But they must be handled wisely, for the process of fighting fire with fire is one to be thoroughly studied.

Mr. Greene's view regarding the use of fire in forest culture will encounter much opposition. The majority of foresters and those unofficially interested in forests believe that fire, no matter how applied, is definitely harmful. For them, there are other and better ways of perpetuating the South's long-leaf pine.

ITEMS

FROM its inexhaustible storehouse of wealth, the sea will in the future supply man with useful substances of all kinds from precious metals to essential elements of diet and common chemicals, H. F. Taylor, of New York, fishing industry executive, predicted before the Franklin Institute. Of the 92 chemical elements, 47 are found in the sea, Mr. Taylor pointed out. They are in solution in water, in tissues in living plants or animals, or in bottom sediments. Few of them are now recovered for use by man. Salt, iodine, bromine, magnesium chloride and magnesium hydroxide are the only substances that are now being taken from the ocean in quantity, it was said, because they can be separated from the water by such crude processes as evaporation and precipitation. Mr. Taylor predicted, however, that research will develop refined methods which will be used to economically recover the more valuable substances.

A NEW stratosphere balloon, to emulate last year's high-altitude flight by Professor August Piccard, is being built at Augsburg to the order of Count Theodor Zichy, a Hungarian nobleman, and Hans Braun, a Vienna engineer. It is to carry a 75-foot parachute to insure safety in landing. A radio sending set is also reported to be part of the equipment.

NEW evidence for the existence in plants of a growth-promoting substance resembling the hormones or ductless gland secretions of animals has been reported to the National Academy of Sciences, through the medium of its *Proceedings,* by H. E. Dolk and K. V. Thimann, of the California Institute of Technology. They grew cultures of a mold in closed glass dishes, in such a way that they could pass a slow continuous stream of sterile culture fluid through them, thus draining off a very weak solution of the growth-promoting stuff as the mold plants gave it off. After concentrating and purifying this, they tested its effects on young oat sprouts. They measured its strength by the time required for it to cause the srouts to bend through a given distance, when the substance was applied on only one side of the growing region, causing more rapid growth on that side. They have also begun a chemical study of the substance, testing the effects of various reagents on it. They have demonstrated that the substance itself is an acid.

EIGHT hundred miles of waterway linking rich radium discoveries with civilization are being improved by the Hudson Bay Company in order that valuable ores newly discovered in the Canadian Northwest Territories can be transported, according to Mr. Hugh S. Spence, mining expert for the Canadian Government, who spoke at the meeting of Mining and Metallurgical Engineers. The radium ores are worth $70,000 a ton at present prices and silver ores found in the same workings assay $3,000 a ton. Airplanes have been used to carry prospectors and miners back and forth, but it will be more economical to carry the heavy ore by water. Twenty tons of ore were brought out last summer, but the difficulties were great. Most of the improvements are being made on the Great Bear River, the outlet from Great Bear Lake on which are situated the new mines. The Great Bear River leads to the Mackenzie down which some seven thousand tons of freight are carried in the fur steamers each year. One ten-ton scow is the only means of transport at present on Great Bear Lake itself.

THE parent substance of the life-essential, scurvy-preventing vitamin C is none other than the poison narcotine, investigations of Dr. Otto Rygh, his wife, Dr. Aagot Rygh, and Dr. Per Laland at Oslo have shown. Narcotine is one of the alkaloid poisons found in opium and is related to morphine, but in spite of its name does not have any narcotic effect. It is transformed into vitamin C during the ripening of fruits and vegetables. The isolation of vitamin C and discovery of its parent substance came as a result of studies of the occurrence of the vitamin in various fruits and vegetables such as oranges, lemons, tomatoes, white cabbages and potatoes. The Norwegian scientists found that narcotine was present in the unripe fruits but gradually disappeared as the ripening proceeded and the ripe products contained the vitamin but no narcotine. It was found that methylnornarcotine, derived from narcotine, could prevent or relieve scurvy.

OIL calmed troubled waters in a very practical way when waves from 50 to 60 feet high in the middle of the Pacific Ocean threatened to bring disaster to the *S. S. Elizabeth Kellogg* on its recent voyage from Manila to San Pedro, Calif., the Hydrographic Office of the U. S. Navy has been informed. The worst seas that Captain Kort, master of the vessel, has seen in his twenty-five years' experience as a captain rolled over the lower decks and finally carried away everything and dented the after steel deckhouse seven inches. Then oil was pumped through sanitary drains on the water. After the oil spread, the combers lost their terrific force and rolled safely under the stern of the vessel instead of breaking over the decks.