SCIENCE NEWS

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NEW ATOMIC PARTICLES

ARE there two new, mysterious atomic particles or building blocks of the universe? Or are the particles, intermediate in weight between electron and proton, discovered at California Institute of Technology and at Harvard the same?

The new form of matter discovered by Dr. Carl D. Anderson and Dr. Seth Neddermeyer, of the California Institute of Technology, came to public notice through a Science Service dispatch last November and a full report will appear shortly.

An unusual penetrating particle in cosmic rays was reported by Drs. J. C. Street and E. C. Stevenson, of Harvard University, to the recent meeting of the American Physical Society in Washington. The Anderson-Neddermeyer particle carries the same amount of electricity as an electron, but both positives and negatives are found. In mass it is intermediate between electron and proton. The Street-Stevenson particle is described as being neither electron nor proton. Both occur in cosmic radiation and the Harvard studies indicate that 80 per cent. of the cosmic rays reaching sea-level are the new particle.

The new particle, or particles, do not fit into present theories. This is an indication of the comparatively poor state of theoretical physics when it comes to explaining the collision of particles at the enormously high energies encountered in cosmic rays. There is now complete agreement that all the evidence points to outer space as the origin of cosmic rays. When these rays strike the upper layers of the earth's atmosphere, there are terrific collisions with the air atoms present. It is generally recognized that perhaps inside the first 10 per cent. of the earth's atmosphere, counting from the top, there is much absorption and that what occurs and is measured on the earth is merely the tremendously complicated débris of a whole series of violent collisions, set off by the primary cosmic rays.

Up to energies of some 400,000,000 electron-volts, workers are fairly confident that their present theories give at least an approximately correct picture of the happenings that occur. But they admit that in the energy range above 400,000,000 the theory is behind experiment. The particle or particles recently reported may represent additional evidence of this fact.

The favored mathematical theory of the moment which was quoted by many of those presenting papers on the cosmic ray is that of Drs. J. F. Carlson and J. R. Oppenheimer, of the University of California. Drs. Carlson and Oppenheimer published their paper "On Multiplicative Showers" on February 15. Their mathematical report is considered one of the best attempts to link the theory and experimental facts in the high energy range encountered in cosmic ray studies.

Drs. Carlson and Oppenheimer pointed out then that quantum theory indicated that for very high energy particles striking the upper atmosphere, for example, it might be possible to have the formation of pairs of particles and energy losses which would no longer depend on the energy in the incoming radiation. Thus, at least in theory, it might be conceivable that the secondary "débris" produced by either a photon or radiation or by an electron, might be almost as penetrating as the primary effect. In the intricate conglomeration that is observed on earth, the primary energy which came onto the earth from outer space is soon distributed among a large number of electrons and photons. How these so-called "showers" or "bursts" of cosmic rays are developed and the way the showers are absorbed was the detailed function of their report.

While the Carlson-Oppenheimer theory is considered the best of its kind at present no one doubts that it will be extended and perhaps modified in the future. Whether the supposed "new" half-way particle or particles reported will fit into a modified theory is, of course, not yet known and its existence will have to be certified to by much independent work.

THE TOTAL ECLIPSE OF THE SUN

To witness the longest eclipse which has occurred in over 1,200 years astronomers have only two spots in the world where they can do worthwhile scientific work; low-lying islands in the South Seas archipelago that rise only a few feet above high water, or the coast of Peru where observing stations from 3,000 to 10,000 feet altitude offer the best possibilities. Nowhere else in the 8,000-mile-long curving arc which will trace out the shadow cast by the moon on the earth's surface on June 8, is there a firm foundation on which to mount equipment.

The astronomers of the United States are concentrating on two spots. First choice, but difficult to reach, are the Enderbury and Canton islands of the Phoenix group in the South Pacific some 1,800 miles southwest of Hawaii and 3,000 northeast of Australia and just south of the equator. On Enderbury Island the period of total blocking off of the sun's light will last four minutes and 10 seconds. The sun will be nearly 23 degrees high in the sky early in the morning at 7 hours, 42 minutes and 6 seconds in the morning.

Those observing groups not fortunate enough to finance such a distant expedition, and to secure the needed transportation furnished by the Navy, are concentrating on the coast of Peru where, at about 5: 10 P.M. local time the sun will be blocked out, for three minutes and 24 seconds. The major potential hindrance with this site is that the sun will set at 5: 45 P.M. and thus will be very low in the sky; only some eight degrees above the horizon.

Observations are comparatively difficult at this low altitude for the sun's rays must pass through great lengths of the earth's atmosphere and convection currents in the air, dust and other troubles interfere. However, on June 19, 1936, excellent photographs of the sun's corona were secured at Chios when the sun was only a little over nine degrees above the horizon.

The expedition of the U. S. Navy-National Geographic Society will employ a new device developed by Dr. Irvine

Gardner, of the National Bureau of Standards, that should obtain better pictures of the far-flung, but faint, streamers which blaze out hundreds of thousands of miles into space from the shining corona of the sun.

Dr. Gardner's device is a rotating disk with four sections cut out of it. This disk spins 100 times a minute in front of his telescopic camera. The amount of light reaching the photographic plates depends on the openings in the disk. Out near the rim the openings are large and nearly all the light will come through. Nearer the center, more and more light is cut off. The object of the device is to secure about equal light from the brilliantly bright part of the corona near the sun's surface and from the very faint outer portions of the corona. Photographs of the corona, in the past, have sometimes been overexposed by the brilliant inner corona before sufficient light from the outer corona was obtained.

On the Peruvian coast, north of Chimbote, at an altitude of 3,000 feet will be another new device being used for the first time in a total eclipse of the sun—the fast Schmidt type camera operated by Professor Charles H. Smiley, director of the Ladd Observatory of Brown University. This small camera will have an optical aperture of f/1, which means that the light-collecting mirror of the instrument is equal to its focal length. The best of candid cameras, one can recall, are f/2 or f/1.5, while most telescope cameras are f/10 or more. The lower the aperture the greater the light-gathering power of the instrument and the shorter may be the exposure time. Professor Smiley's Schmidt camera can scan the sky through 20 astronomical degrees, while the ordinary reflector camera can picture only about one degree. The fast light-gathering camera should be useful in recording the relatively poor lighting conditions that will prevail in Peru.—ROBERT D. POTTER.

A FOSSIL PLANT OF THE CAMBRIAN ERA

THE world's oldest land plant, estimated to be about 500,000,000 years old or almost twice as old as previously discovered specimens, has been detected from its fossil remains. The primitive shoot, found in black oil shale from Sweden, is believed to have lived during the Cambrian era, a fact that substantially doubles the known age of higher plant forms on earth. Previous evidence has indicated that plant life first emerged from the water during the uppermost Silurian period or just under 300,000,000 years ago.

Investigators have for some time suspected that land plants probably existed during the earlier Cambrian period from a study of the fossils of animals of that era which must have depended to some extent on plants in their diet. This indirect evidence, however, has never previously been confirmed by discovery of the remains of the plants themselves.

William C. Darrah, instructor in botany and research curator of the Botanical Museum of Harvard University, identified the Cambrian plant by a new process in which a transparent cross-section only one twenty-five-thousandth of an inch thick can be cut from a fossil for microscopic study. While many samples of Cambrian oil shale have been available for study previously, they are so black that close microscopic study under large magnification has been impossible until the new method was developed.

Examined with the new technique, however, the shale was found to contain minute plant spores, barely visible to the naked eye. Each is marked by a small three-pointed star or tetrad-scar, a characteristic of early growth stages in higher plants but not found in the more primitive water plants. Another characteristic of land plant spores was also detected, their wax coating which wards off water and decay. Because of this coating the spores have been preserved through the ages while the fleshy parts of the early plants have been crushed and destroyed.

RECORDS OF NIGHT WIND VELOCITIES

A PHOTOGRAPHIC method of charting the directions and velocities of night winds high above the earth, a development expected to be of considerable value in weather forecasting and aircraft operation, has been developed in the meteorological laboratory of the Massachusetts Institute of Technology.

The cardinal feature of the method lies in its use of a "whole sky camera," one employing a wide-angle or 180-degree lens, and a sounding balloon equipped with flares so attached to an ordinary piece of blasting fuse that they flash at set time intervals. Developed by Athelstan F. Spilhaus, of the Woods Hole Oceanographic Institute, now conducting research at the Massachusetts Institute of Technology, the new method is expected to permit studies of complicated wind structures not only in greater detail than has heretofore been possible but more accurately and more easily as well.

In operation the camera is set at a chosen observation point with its lens pointing directly overhead. As the balloon ascends the flashes of the magnesium flares, set off at time intervals as small as five seconds if desired, are recorded on the photographic plate. The picture taken by the wide-angle lens is circular, the circumference showing the horizon on all sides. Thus the brilliant magnesium flashes are recorded regardless of what direction the balloon takes. By measuring the resulting angles of elevation and direction between the camera station and the recorded flashes and correlating this data with the rate of the balloon's ascent, a complete and accurate record of wind velocity and direction is easily obtained.

The previous method of charting winds of the upper air has been to release a balloon and to follow its course with a theodolite with which the investigator reads the angles of elevation and direction every half-minute or minute. At night, research workers have hung a paper lantern containing a lighted candle from the balloon and followed this light. The candle is very dim and its light lost rather quickly. Some have been known to plot the course of stars, thinking they were trailing the lantern.

The Spilhaus method, however, practically eliminates this "human equation" and even the most inexperienced observers can easily make rapid and accurate readings photographically. In preliminary tests the flashes have been recorded at distances as great as seven miles and at heights in excess of 13,000 feet. Meteorologists expect, however, that both this distance and this altitude can be greatly exceeded.

OCCUPATIONAL HAZARDS

LEAD poisoning, and not silicosis or any of the other occupational diseases, is the chief hazard to the health of workers in industry, according to Dr. William D. McNally, of Rush Medical College, Chicago, who spoke at the Midwest Conference on Occupational Diseases in Detroit. Wherever dusts are found containing lead, whether it be in mines, smelting, in the manufacture of lead pigments, or in the manufacture of storage battery plates, poisoning is certain to result.

Carbon monoxide and fumes from oxides of nitrogen in dynamite explosions were described as other serious industrial health hazards. There are over nine hundred occupations causing injurious effect upon the health of the individuals engaged in them.

Silicosis, caused by inhalation of silica-laden dust, predisposes the lining of the bronchial tubes to attacks of bronchitis. The bronchitis lays a foundation for pneumonia and tuberculosis. Preventive measures must include the examination of every new employee, good ventilation, masks, and the use of wet processes wherever feasible. Post-mortem examinations are advocated in all cases of death where the worker had been engaged in a dusty atmosphere, as microscopical and chemical examination of the lungs will definitely prove whether or not the cause in question is one of silicosis.

Carbon monoxide, one of the most important poisons associated with human life and industry, is without doubt the oldest known poison. Wherever gasoline engines are operated, wherever gas heat appliances are used or wherever there is incomplete combustion of any carbonaceous material, this gas is present. The excellent results obtained in the treatment of carbon monoxide by carbon dioxide and oxygen renders all other methods superfluous.

The danger of inhaling oxides of nitrogen was emphasized because of their delayed action. A workman may leave his job complaining of only a bronchial irritation after inhaling the fumes of a dynamite explosion. Several hours later, his lungs become edematous and death may occur within 24 hours. Danger in the use of solvents, such as benzol, carbon tetrachloride and trichlorethylene, lies not only in industry but in the home as well. Quantities larger than one pint should not be sold to the laity.

ITEMS

A NEW and better way of making serum to cure pneumonia was described by Dr. Rufus Cole, of the Hospital of the Rockefeller Institute, New York City, at the Conference of State and Provincial Health Authorities of North America, held recently in Washington. Using rabbits instead of horses, two associates of Dr. Cole, Drs. Kenneth Goodner and Frank I. Horsfall, were able to make a serum that is more effective and cheaper to produce. Greater effectiveness results from the fact that the antibody molecules produced in the rabbit's body to fight the pneumonia germs are smaller than the horse's antibodies and consequently spread more rapidly through tissues infected with pneumonia germs. Fighting pneumonia due to the pneumococcus depends on getting as many of these antibodies into the patient's body as possible. For this reason Dr. Cole advocates large doses of serum, given as early in the disease as possible.

THAT rats allowed to choose their own food from a variety of substances gained weight more rapidly than other rats fed a diet prescribed by an authority on nutrition was reported to the Memphis meeting of the Federation of American Societies for Experimental Biology by Drs. Curt P. Richter, L. E. Holt, Jr., and Bruno Barelare, of the Johns Hopkins Hospital. The menu from which the rats made their choice was made up of purified casein, olive oil, dextrose, salt, calcium lactate, dry yeast and cod-liver oil. The animals could be divided into two groups, those which selected predominantly olive oil and those which selected predominantly sugar. Both groups, however, showed practically normal activity and sex cycles. When the animals were given their choice of the menu with cod-liver oil omitted, they showed signs of lack of the vitamin A of the oil. When given access to cod-liver oil, they showed a definite appetite for it, resulting in disappearance of the symptoms of lack of vitamin A. The same thing occurred when yeast, source of vitamin B, was omitted and then put back on the menu.

PLACES on earth where the pull of gravity is greater than normal and other places where is it less were among the points discussed at the recent meeting of the American Physical Society by Walter D. Lambert, of the U. S. Coast and Geodetic Survey. Much work has been done recently on the existence of pronounced anomalies under the ocean, particularly in the neighborhood of the great deeps, where mountain ranges could be sunk without a trace. Why positive anomalies, or excess gravitational pull, should exist in the neighborhood of these deeps is still unsolved. There would seem to be a pile-up of denser rock material in these areas. Whether or not such rocks are in the process of slowly "flowing" in the direction of lower density has yet to be determined.

SUCCESSFUL use of sulfanalamide and its relative Prontosil, in the treatment of common refractory streptococcus infections, such as childbed fever and infections of the kidney and bladder, was reported by Dr. Russell D. Herrold, of the University of Illinois College of Medicine, at the Chicago meeting of the Society for Experimental Biology and Medicine. This drug would seem to be the first definite advance in the use of chemicals to combat infections since the discovery of the chemical treatment of syphilis. It opens a new field in the fight against infectious diseases. It is startlingly successful, often in as short a time as three days. Its action apparently is somewhat different from that of another useful urinary tract antiseptic, mandelic acid, which has become quite generally used in the past six months. It is destined to almost completely replace the acid. The new compound is much more palatable to the patient. In one tenth of cases, mandelic acid can not be used. The new chemical has revealed no such limitations yet. The chemical is taken by mouth in tablet form and in serious cases is made into a solution for hypodermic injection.