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SOME PAPERS READ BEFORE THE NORWICH MEETING OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

PREPARATION of 99 per cent. pure "heavy" neon, the gaseous element most widely known for its use in reddish advertising signs, was announced before the meeting of the British Association for the Advancement of Science by Dr. Gustav Hertz, of the Siemens-Halske Company, Berlin. The achievement is comparable with the concentration of pure heavy hydrogen for which Professor Harold C. Urey, Columbia University, recently was awarded the Nobel Prize in chemistry, because of the importance of neon in experiments on atomic structure. Ordinary neon gas consists of two isotopes, which are chemically indistinguishable but have different atomic weights. The lighter and predominating fraction has an atomic weight of 20 and the heavier one weight of 22. As found naturally, they occur in the proportion of nine to one, respectively, and give the average atomic weight of 20.2. Dr. Hertz's concentration of the mass 22 kind of neon makes the second isotope now separated into usable quantities. The heavy isotope of hydrogen is the other. Samples of the almost pure heavy neon have already been given to Professor F. W. Aston, of the University of Cambridge. Another sample is being sent to Dr. Kenneth Bainbridge, of Bartol Research Foundation, Swarthmore, Pa., for analysis on his mass-spectrograph. Professor Ernest O. Lawrence, of the University of California, may also receive some of the heavy neon for experiments in nuclear physics. Commenting on the concentrated heavy isotope of neon, Professor Aston called the work a great aid to experiments on nuclear disintegration, because by using the heavy neon gas, investigators can be sure that its weight is unambiguously 22. Recent work has shown that nuclear studies such as artificial radioactivity and transmutation ought to be done, for best results, with really pure elements; the word pure being used in its physical as well as chemical meaning. Dr. Hertz uses the diffusion technique for separating the neon isotopes. A battery of tubes containing porous material is filled with chemically pure neon gas as obtained from the chemist. Mercury vapor pumps drive the neon through the system. As the gas comes to the porous material, the lighter kind of neon passes through a little faster than the heavier kind because of the difference in the diffusion rates. The lighter fraction passes back to the opposite side of the porous tube and repeats the process while the heavier fraction passes on to the second porous tube, then to a third, and so on. Each porous tube has the return system whereby the lighter isotope is each time returned to repeat the diffusing process. Continuous operation and circulation of the gases is maintained by the pumping system. Starting with the original neon gas in the ratio of 9.3 parts of isotope of mass 20 to one part of isotope of mass 22, only one hour is needed to bring them to equal concentrations. Five hours suffice to bring the heavier isotope up to 98 to 99 per cent. concentration.—*Watson Davis.*

NEW fields of research in stratosphere balloon ascensions should include studies to see if neutrons are being shot out by the sun, according to Lord Rutherford of Nelson, head of Cavendish Laboratory, Cambridge. In laboratory experiments neutrons, fundamental units of matter out of which atoms are composed, make possible the transmutation of one element into another. It might be possible to detect neutrons from the sun high in the earth's atmosphere and they should be looked for as high as scientists can reach in manned and unmanned balloons. If neutrons occur in the sun and the other stars of the universe, they should be very effective in causing breaking down and building up processes among the elements by the atomic transformation discovered by Madame Curie-Joliot and her husband, M. Joliot, in their Paris laboratory, Lord Rutherford also suggested. The fears of investigators that the physical laws of the conservation of energy do not hold in experiments on atomic collisions are rapidly lessening. Up until last year, he pointed out, certain tests seemed to indicate that more energy was liberated in some types of atomic collisions than was put into them. In his opinion, Lord Rutherford continued, recent studies on the nucleus of atoms justify the assumption that the conservation of energy holds for all atomic transformations. New measurements on the masses of atoms by Professor F. W. Aston at the University of Cambridge in particular, Lord Rutherford indicated, have shown that the masses of some elements were not previously known with sufficient precision. Such lack of knowledge, if not proving definitely that the conservation law holds, plainly strengthens the case for the hitherto basic principle of physical science.—*Watson Davis.*

DR. P. B. MOON reported that "cold" neutrons, cooled to the temperature of liquid oxygen at minus 130 degrees below zero Fahrenheit, are the latest means of increasing the efficiency of artificial radioactivity bombardments in the laboratory. Temperature profoundly changes the ability of the newly-discovered neutron particles to cause radioactivity when they are used as atomic bullets. Artificial radioactivity produced by atom bombardment causes the atoms of the struck element to give off beta and gamma rays like those which come spontaneously from the naturally radioactive elements like radium and thorium. Aside from the technical aids to the study of atomic nuclei in such experiments, there is always, in the background, the hope that if the process can be made efficient enough, mankind will at last have an artificial substitute for expensive radium. And thereby the radiation therapy of cancer will be benefited. Discoveries of ways to increase the efficiency of the artificial radioactive

effect by neutron bombardments have been several and rapid. It is now known that if the neutrons can be slowed up by passing them through paraffin-wax and water before they impact on the element being activated, the radioactive effect is increased. Much energy is lost by bringing about this multiple bumping about in hydrogen-containing materials, but the final result seems to be that after being slowed down the neutrons are much more efficient in transferring their remaining energy to the atoms of the target. The suggestion has been advanced, Dr. Moon pointed out, that the neutrons might be so slow that they had only energy equivalent to the ever-present thermal agitation of the material through which they were going. If this were so, the efficiency of the neutrons as radioactivity producers should depend on their temperature. Dr. Moon reports that this effect has been definitely shown by experiments wherein the artificial beta ray activity of silver was increased some 30 per cent. if the neutrons producing it are cooled to the temperature of liquid air.

MANKIND'S earliest cradle will be sought in Central Asia by the noted French student of human pre-history, Pére P. Teilhard de Chardin, who will take the field this fall. This announcement was made by Sir Arthur Smith Woodward, of the British Museum, in the course of his address as president of the section on anthropology. The project was originated by the late Dr. Davidson Black, who first gave to the world the scientific details of the ancient skeletons now known as Peking Man. He planned to make a careful study of the pre-glacial Tertiary deposits in south Central Asia, and in 1932 actually traveled overland from China to Syria, passing through the region under consideration. Unfortunately, he died before he could carry out his project, and Pére Teilhard, who was closely associated with him in the last few years of his scientific work, has undertaken to see it through. The central Asiatic uplands are indicated as a promising place to explore for the remains of earliest man for more than one reason. Sir Arthur called attention to a supporting basic principle in the study of evolution laid down by the late Dr. W. D. Matthew, of the University of California. Dr. Matthew pointed out that it would be reasonable to expect the highest evolved forms of a given line of development to be in or near the place of original development, and that lower forms would be found at the outer fringes of its total area of distribution. The relatively few remains of very early man that have been found form a rough circle around Central Asia: they include Piltdown Man in England; the Heidelberg Man in Germany, the Peking Man in China and the Trinil Man in Java. Central Asia is a "good bet" for manward evolution from a possible ape-like ancestral stock, on grounds of geologic history, Sir Arthur continued, citing in support earlier workers. He said that "The east-to-west ridge of the Himalayan Mountains was gradually raised up at the time when northern India was covered with a great forest which swarmed with apes of many kinds. The formation of the ridge separated off a northern portion of the forest which became subject to comparatively inclement conditions. The apes stranded in this northern portion would be disturbed by the extensive destruction of the trees, and the survivors would be driven to be ground-apes and change their habits of feeding. They would thus be modified in the direction of man. Regarded from the zoological point of view, of course, man is an arboreal mammal which has left the forest. His remote ancestors, by continuing to live in the forest, preserved their jaws, teeth and limbs nearly on the primitive mammalian plan while the brain alone made progress."

DR. F. J. W. WHIPPLE, of Kew Observatory, stated that deep-focus earthquakes occurring hundreds of miles inside the earth instead of merely in the comparatively thin upper crust of rock are being intensively studied by seismologists. Most earthquakes recorded on the seismological stations throughout the world originate, Dr. Whipple said, less than 31 miles below the earth's surface. Quakes at deep-foci start many times deeper than this. In Japan especially, he pointed out, studies show that these deep quakes are distributed in a very remarkable way, indicating that there exist well-defined flaws in the earth at depths of from 62 to 180 miles and far below the level of isostatic compensation. Such new findings are among the most spectacular of recent advances. The reason is that present beliefs tend to picture the solid rocky crust of the earth as floating on a denser semi-plastic material lower down. As one part of the crust sank down into the material, there was a compensating uplifting somewhere else on the earth. Mountain ranges such as the Himalayas appear still to be undergoing this lifting process. That the underlying semi-plastic material might itself have well-defined flaws still lower was hardly considered until the recent discoveries based on the way earthquake waves are transmitted through the earth.

THE Sahara Desert is spreading southward well over a half mile a year. During the past 300 years the torrid sands have encroached some 186 miles into what was once fertile farm and grazing land. Unwise methods of farming, grazing and forest use are making a present of some of the best lands in Central Africa to the Sahara Desert, according to Professor E. P. Stebbing, of the University of Edinburgh. Professor Stebbing's observations were made during a tour last year through parts of several British and French colonies in West Africa. Three factors, in his opinion, contribute most heavily toward this encroachment of the desert on lands once fit for human occupation. The natives practise what is called "shifting agriculture." They clear a piece of land, burn the felled trees, cultivate the soil for a year or two or three, then move on to repeat the performance elsewhere, leaving the abandoned clearing to grow up into "bush." The forest does not take it back. A second factor is the further destruction of the forests by fires deliberately set. Increasing populations depending on cattle, sheep and goats have introduced the third factor, overgrazing. Stripped of its binding cover of grass, the soil dries out. Water fails, both for the restoration of the range and for the replenishment of the wells.