SCIENCE NEWS

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TRIPLE WEIGHT HYDROGEN

EXISTENCE of triple weight hydrogen, hitherto suspected but unproved, may be demonstrated by a sensational atom-smashing experiment made by Lord Rutherford, and Drs. M. L. Oliphant and P. Hartleck, of the Cavendish Laboratory at Cambridge, England, announced to the scientific world through the forthcoming issue of the journal, *Nature*.

Double weight hydrogen, now being studied intensively in the chemical laboratories throughout the world following its discovery in America two years ago, was both target and projectile in the new atomic bombardment. Hearts of heavy hydrogen, called deutons in America and diplons in England, were flung with hundred thousand volt energy at salts of ammonia that contained heavy hydrogen instead of ordinary single-weight hydrogen. This impact of deutons upon deutons (or diplons upon diplons, to follow the nomenclature preferred by Lord Rutherford) gave striking results.

There was enormous emission of fast protons or hydrogen hearts with energies of three million volts. Thus particles released had thirty times the energy of those used in the atomic attack. Two hypotheses have been made—either two heavy hydrogen atomic hearts reacted to give a new hydrogen variety of mass three, and an ordinary hydrogen atom. Or they formed a helium atom of mass three and a neutron.

Even if it turns out that mass three helium instead of a triple weight hydrogen is formed, this will prove to be an important discovery. No atoms of mass three have been unequivocally demonstrated in the past although vigorous searches have been made for them. The weight of ordinary helium is four units on the chemical scale on which ordinary oxygen is sixteen.

This discovery of a mass-three atomic heart and the enormous volume atomic transmutations achieved is expected to have important influence upon research on the composition of matter.

ARTIFICIAL RADIOACTIVITY

THE newest process for the production of artificial radioactivity is to bombard the light elements, boron and carbon, with hydrogen atomic hearts.

Dr. C. C. Lauritsen, R. D. Crane and W. W. Harper, of the California Institute of Technology, using their giant high voltage tube, have caused the formation of radioactive products by proton bombardment.

A few weeks ago Professor F. Joliot and Mme. Irene Curie-Joliot produced artificial radioactivity for the first time, and investigators carried the work further by producing the delayed emission of positrons by flinging deutons, the hearts of heavy hydrogen atoms, at elements.

The products now formed by proton bombardment seem to be the same as those formed when deutons are used instead of protons because their life history is exactly the same. It takes twenty minutes to lose half the activity in the case of the boron product and ten minutes in the case of the radioactivity produced in carbon.

The discoverers believe that the proton breaks up on entering the target atom and forms a neutron and a positron. The neutron escapes immediately but the positive electron is temporarily caught, thus transmuting the boron into carbon and the carbon into nitrogen. They regard this as more plausible than the capture of the whole proton because their energy and momentum equations balance most easily if the neutron escapes. Investigators want to balance their equations as eagerly as a bookkeeper wants to balance his books. This energy balance will furnish the simplest method so far discovered for weighing the neutron. Preliminary measurements give 1.006 for the neutron mass.

An interesting feature of the Pasadena experiment is the formation of active gases. The gas produced in the boron bombardment comes off quite readily, but carbon seems to want to hold on to its product unless heated rather vigorously.

THE ORIGIN OF GEYSERS AND HOT SPRINGS

GEYSERS and hot springs, such as those of Yellowstone National Park, are in reality steam-heated springs. The greater part of their water is ordinary rain- and snow-water from the ground surface, but their heat is supplied by steam seeping up from buried lava masses far beneath the earth.

This, in brief summary, is the doctrine of geyser and hot spring action set forth by Dr. E. T. Allen, of Washington, D. C., in a lecture given under the auspices of the Carnegie Institution of Washington. Dr. Allen spent seven years in scientific research on the hot-water phenomena of the Yellowstone.

Earlier theories of hot spring action, the speaker said, belonged to two opposing schools. The first held that everything discharged by a geyser or hot spring—water, steam and dissolved minerals—originated at or near the surface. The water descended through the earth until it encountered hot rock and was thereby heated. The opposing theory was that the discharge was all supplied from deep sources, the hot water being merely condensed out of some of the steam.

Neither theory is entirely true; hot springs and geysers receive contributions from both above and beneath. The importance of surface water in their formation is shown by the fact that hot springs are most abundant and flow most freely in exactly the kind of valleys or basins that favor the formation of cold springs.

Evidence that the heat source is steam released by beds of lava is supplied partly by comparative studies on the kind of steam and gas discharges that arise from lava in volcanic regions, partly by direct study of the steam and gases of the Yellowstone hot springs themselves. Besides steam, the Yellowstone vents discharge gases such as carbon dioxide, hydrogen sulphide and other products

abundant in active lava, but present only as traces in the surface rocks of the regions where these hot springs are located.

Another argument for the independence of the steam source, Dr. Allen pointed out, is that while the water discharge from the hot springs varies, the steam discharge does not. A hot spring may dwindle during a season of drought and may finally cease to flow any water at all. But when that happens it simply turns into a steam vent, continuing to discharge steam and the other volcanic gases.

THE CONTROL OF FUNGI

SETTING a thief to catch a thief is an old adage that has been given a new meaning by Dr. Conrad M. Haenseler, of Rutgers University. His experiments suggest the possibility of killing of plant disease fungi by using other fungi, just as entomologists have long fought insect pests by turning loose other insects that are their natural enemies.

Rhyzoctonia and Pythium, two genera of plant disease fungi, were used in the experiments. These are extremely destructive in seed beds, causing what is known as "damping off," a disease which kills seedlings by rotting them near the ground line. The friendly fungus used in the miniature combat within the laboratory was Trichoderma, a tiny, thread-like plant growth, microscopic in size, which is commonly found in the soil.

Dr. Haenseler and M. C. Allen, research assistant in soil microbiology at the experiment station, inoculated a sterile seed bed with the three species of fungi and then planted cucumbers. In the beds containing the friendly fungus, twice as many seedlings grew and only a slight damping off was discovered, as compared with seed beds inoculated with only Rhyzoctonia and Pythium.

Several tests were made in the greenhouse with cucumbers and with peas. In the laboratory, tests showed that in a nutrient solution in which Trichoderma had recently been grown, Rhyzoctonia and Pythium could not be made to grow. This proves that the Trichoderma, in growing, gave off or produced in the solution some substance toxic to these pathogenic fungi. That "something" is still an unknown quantity. Heating the solution to near the boiling point kills the toxic substance given off by Trichoderma. Exposing the filtrates to pure oxygen also destroys their toxic principles very rapidly.

ITEMS

A NEW heavenly object, probably a peculiar asteroid or minor planet, has come within range of large telescopes, the Harvard College Observatory has been informed by the central astronomical reporting bureau of Copenhagen. The discovery was made by L. Boyer, assistant at the Algiers University Observatory, located at Bouzareah, where intensive researches on asteroids are carried on. Boyer's object, as it is known after its discoverer, is in the constellation of Leo, the lion, nearly overhead in the late evening sky. It is twelfth magnitude and too faint to be seen even in small telescopes. It has now been sighted from America and its position has been determined by Dr. Fred L. Whipple at Harvard's Oak Ridge Observatory; Professor L. E. Cunningham at Harvard's Cambridge Observatory, and H. E. Burton at the U. S. Naval Observatory.

NINE deaths from parrot fever and twenty-five cases of the disease have caused the U. S. Public Health Service to send Dr. L. F. Badger, of the U. S. National Institute of Health, to Pittsburgh to investigate the outbreak there. Dr. Badger has been sent at the request of the Pittsburgh health authorities. The outbreak, said to be one of the most severe that has occurred in some time, originated in a Pittsburgh department store which sold birds. One of the birds from the store was sent to the federal health authorities and on examination was found to have suffered from parrot fever or psittacosis. A severe outbreak of parrot fever in many parts of the country occurred in 1930. In order to fight the disease, which was till then little known, the importation into this country of love birds and parrots, which transmit it, was forbidden temporarily. The disease subsequently affected birds in aviaries in southern California and a number of cases were reported from that source. The disease has now become rather a commonplace instead of being a novelty, and outbreaks of two or three cases are reported to the U. S. Public Health Service every few months. The outbreak in Pittsburgh seems to be much more severe.

BORROWING methods used by those who study air conditions in the upper atmosphere, investigators at Massachusetts Institute of Technology have devised an instrument for recording the temperature of the sea down to a depth of 600 feet. This instrument, built on the same principle as the meteorograph and called the "oceanograph," will be used to study ocean temperatures at various depths for the information which they give of the currents that are so important to ocean "weather." The oceanograph was developed by Professor Carl G. Rossby and Dr. Karl O. Lange, and R. D. Feiber, an expert on instruments. The instrument will be used on board the *Atlantis*, research ship of the Woods Hole Oceanographic Institution.

JUST how much nitrogen, carbon dioxide or other inert gas needs to be released in a warehouse to stop a fire can now be computed as a result of mathematical methods developed by Dr. S. H. Ingberg, of the U. S. Bureau of Standards, reported in *Physics*. His calculations also apply to the reverse situation, the flushing out of a toxic gas from an enclosure so that its atmosphere will be sufficiently pure to allow workers to enter.

A SPECIMEN of the centurio bat, a creature so rare that in the hundred years it has been known to science only a dozen specimens have been taken, has been captured by the Leon Mandel Guatemalan Expedition of the Field Museum of Natural History, according to word received from its leader, Karl P. Schmidt. The animal has white patches on its shoulders, which suggested to the Spanish scientists who first studied it the white epaulets worn by the centurions in the legions of ancient Rome.