SCIENCE NEWS

Science Service, Washington, D. C.

THE PRODUCTION OF TRIPLE WEIGHT HYDROGEN AT PRINCETON

BY "boiling down" seventy-five tons of water over a period of a year, ten drops of the precious liquid, richer in rare "hydrogen three" isotope than any ever made before, has been obtained by the chemistry department of Princeton University. According to Professor Hugh S. Taylor, chairman of the department, who described the work before the Electrochemical Society, one part in ten thousand of the half gram is fluid in which the hydrogen is of mass three instead of mass one as in ordinary water.

In the drinking variety of water the rare isotope of hydrogen is present to the extent of only one part in ten thousand million. Such extremely minute concentrations are comparable with those encountered by Madame Marie Curie and her husband in their original experiments on the extraction of the element radium from its ores. Radium ore which will yield one half a gram of radium for five tons of ore is considered remarkably rich. Radium ores producing a half gram of radium for 100 tons of ore are worked commercially.

Explaining the work, Professor Taylor said:

"In addition to the hydrogen isotope deuterium of mass 2 discovered by Professor Harold C. Urey, of Columbia University, for which he received the Nobel Prize in 1934, it is now known that a third hydrogen of mass 3 also exists. This still heavier atom of hydrogen has been produced artificially in Cambridge, England, and in the Palmer Physical Laboratory of Princeton University by nuclear disintegration processes.

"About a year ago by the use of the mass spectrograph designed by Dr. Walker Bleakney, of Princeton, it was shown that the 'heavy water' (deuterium oxide) contained small amounts of the third isotope, tritium, but in a concentration estimated at one part in 200,000 of the 'heavy water' examined.

"During the year the same process of concentration by electrolysis has been continued by Dr. P. W. Selwood, of the Frick Laboratory. There now remains a residual ten drops (one half cubic centimeter) from the electrolysis of 75 tons of ordinary water. The tritium concentration has steadily increased until it is now approximately one part of tritium for every 10,000 parts of deuterium water. The experiments show that in ordinary water this type of hydrogen is present to the extent of only one part in ten thousand million parts of water.

"Similar experiments to ascertain whether the electrolytic process concentrates the heavy oxygen of mass eighteen over that of normal oxygen of mass sixteen have shown that this method is much less efficient. A concentration of water by electrolysis from 120,000 volumes to one volume increased the heavy oxygen concentration merely from one part in 500 to one part in 450.

"While such changes in the ratio of the two species are sufficient for many scientific experiments, it will be necessary to utilize other methods of separation if it is desired to produce pure specimens of the two forms of oxygen similar to those already obtained with deuterium, the heavy hydrogen of mass 2."

Commenting upon the effect the knowledge that hydrogen of mass 3 could be produced by the electrolytic process would have upon scientists, Professor Taylor predicted that it would intensify the interest in this field which was initiated by the discovery of "heavy water."

A NEW DETERMINATION FOR THE ATOMIC WEIGHT OF HYDROGEN

BY WATSON DAVIS

Director, Science Service

A DRASTIC shake-up in science's conception of the weights of the atoms which make up everything in the universe appears imminent, in a report to the Royal Society by Professor M. L. E. Oliphant and A. E. Kempton, of the Cavendish Laboratories of the University of Cambridge. Lord Rutherford, commenting on the discoveries of his colleagues, said that as a consequence of their new discoveries in transmutation experiments on the relationship between hydrogen and oxygen in ordinary water, science sees a way to get around what has been a serious conflict in reconciling disintegration experiments with the laws of the conservation of energy. The worrisome trouble in the past, Lord Rutherford said, appears to have been that the widely recognized measurements on the ratio of the weights of oxygen and hydrogen in water erred by a factor of one part in four thousand.

Correcting Professor F. W. Aston's measurements made on his original "atom scale," the mass spectrograph, by this factor Professor Oliphant finds a beautiful reconciliation for the energies of particles shot out in atom-smashing experiments with the theoretical loss of mass in the process. The discrepancies in the past have raised the question whether more undiscovered fundamental particles exist. The new Cavendish experiments discount such questions.

The new atomic weight of hydrogen is now 1.0081 instead of 1.0078. If the new finding is substantiated independently, every atomic weight table in the science text-books of the world will be obsolete, for the weights of the various atoms are all based on the weight of hydrogen. Any changes in the weight of the latter involve all the other 92 elements. Determining atomic weights by measuring the distance they fly from smashed atoms is now a method more than ten times as accurate as the mass spectrograph, heretofore considered the most accurate of all atom scales.

THE TRANSMISSION OF ULTRA-SHORT RADIO WAVES

A WORLD'S record for long-distance transmission of ultra-short radio waves was achieved when the Buenos

Aires, Argentina, radio station LSL was heard in London, 6,000 miles away. The waves that carried the record-breaking signal were the station's "first harmonics," having a wave-length of seven meters. Their fading characteristic was quite different from that of the primary fourteen-meter signal.

Engineers of the British Broadcasting Company are greatly interested, because there is evidence that the seven-meter signal was carried by reflected waves, after the fashion of the longer wave-lengths, and were not refraction waves or waves of optical nature with their straight-line range extended by starting from a great height, as in an airplane. Hitherto all ultra-short wave transmission records have been established by one of these two methods. The new record is far in excess of the old one that stood until recently, which was only from Berlin to London.

The British Broadcasting Company is especially interested in the reported new long-range record for ultra-short waves, because it expects to start television broadcasting on a seven-meter band during the coming fall. Their pictures will scan at a fineness of 240 lines to the inch. The new Buenos Aires-London record holds out the possibility that this television broadcast may reach much farther than expected.

Television broadcasts are to start in Germany within the next few months. They will probably scan at 180 lines to the inch, with 25 frames per second, and have been announced as the world's first high-quality regular television programs. With the new British television broadcasts in prospect, a sort of unofficial race looms between Britain and Germany.

LIGHT REQUIREMENTS FOR NORMAL READING

YOU need not buy electric light bulbs of extremely high wattage in the fear that use of less powerful lights will ruin the eyesight of members of your household, according to the results of research made by Dr. Miles A. Tinker, of the University of Minnesota.

Reading by lights of lesser intensity does not cause eyestrain unless the eyes are abnormal or the print illegible. In fact, the contrary may be true. Lights of the extremely high intensities often recommended as healthful and necessary may cause discomfort by producing glares.

A minimum of from 25 foot-candles to several hundred has been recommended for reading in the home. The foot-candle is a unit of illumination arrived at by dividing the candle power of the light by the square of its distance from the illuminated surface.

For example, suppose this article is read by the light of a bridge or reading lamp shining directly down on to your paper from a distance of about three feet. The bulb, say, is about 60 candle power (60 watts). Then the illumination on the paper would amount to at least 6.6 foot candles. Experts estimate, however, that the concentration of light caused by the lamp shade might magnify this figure about four times, but this still might leave the illumination below the formerly prescribed minimum of 25-foot candles.

"There is no valid evidence to support the suggestions that the normal eye needs from 25 to several hundred foot-candles of artificial illumination for easy and efficient reading of legible print." For all but abnormal eyes and the reading of illegible print, 10 to 15 foot candles furnish an ample margin of safety in brightness of illumination," Dr. Tinker said. This would mean substituting a 25 candle power bulb for the 60 in your close reading lamp with no harm to the eyes, or the 60 watt lamp could be placed at a much greater distance.

Diffusion of light has a great deal to do with the intensity that should be used. With well-diffused indirect lighting, the intensity may be increased to any desired level without harm to the eyes, but with direct or indirect systems where the light is not well diffused, the higher intensities result in increased glare and should be avoided.

"If the print paper is glazed or shiny, glare becomes more annoying as the intensity of light which is not well diffused is increased. The paper in many magazines and books has varying degrees of gloss, and the light in the majority of living rooms and offices is not well diffused. Consequently, increase of light intensity usually means increased glare. It is highly probable that, with the best diffusion available in the ordinary home and office, the light intensity should not be higher than about 15 foot-candles."

Dr. Tinker's recommendations for reading legible print with the normal eye are as follows: (1) For direct lighting with poor distribution, 3 to 5 foot-candles; (2) for combinations of direct and semi-indirect illumination frequently found in homes, 5 to 10 foot-candles; (3) for the better degrees of light distribution found in some homes and offices, 10 to 15 foot-candles.

For abnormal eyes, or for difficult eye tasks such as the discrimination of fine details, the intensities should be greatly increased. The diffusion should be adequate, however, or eyestrain can not be avoided.

Dr. Tinker's complete report appears in *The American Journal of Optometry.*

VICTIMS OF THE VENUS FLYTRAP

VENUS'S flytrap might with equal correctness be called a spider-trap. This famous insect-catching plant, once called by Darwin "the most wonderful plant in the world," has been re-studied recently by Professor Robert F. Griggs, of the George Washington University, who reported his findings before the Royal Canadian Institute. Professor Griggs discovered that the largest single class of animals among its victims consists of spiders. Examination of hundreds of its trap-like hinged leaves showed that spiders formed 28 per cent. of all its catch. Flies came second, with 24 per cent.

Other prey included beetles, ants and roaches. There was one tiny toad, a scorpion, a couple of snails and one daddylonglegs. In general, the plant's victims were mainly insects that fly little or not at all; there were few highly active fliers like bees and wasps.

Professor Griggs made an effort to find an answer to the old question of what use the plant's carnivorous tendencies are to it; for though it secretes a ferment like

the gastric juice, it has never been proved that it uses the captured victims for food. He was not able, however, to arrive at any completely conclusive findings, for specimens grown in various types of soil, some fed and others kept without insects, all throve about equally.

It is probable that the species once had a far greater range than its present restricted area of about a hundred-mile radius of semi-swampy coastal plain around the city of Wilmington, N. C. Its nearest existing relative is found in Europe. Two colonies of it were experimentally transplanted into bogs far to the north of its present habitat some years ago. One of these is in Maryland just outside the District of Columbia, the other in Virginia. Both colonies survived the severe winter of 1933–34, which was far colder than anything these plants have been called upon to endure for probably thousands of years.

Professor Griggs expressed the wish that people generally might abandon the rather awkward and unbeautiful name, Venus's flytrap, and adopt the more euphonious botanical name, Dionaea, for common use, as they have already adopted such strictly scientific names as chrysanthemum, rhododendron and gladiolus.

A CANCER-PRODUCING CHEMICAL FROM BILE ACID

PRODUCTION of synthetic methylcholanthrene, a cancer-producing chemical previously obtained from bile acid, has been announced at Converse Memorial Laboratory at Harvard by Professor Louis F. Fieser. Easy manufacture of this chemical is expected to facilitate greatly experiments with mice, attacking the perplexing question of the mechanism whereby hydrocarbons of a particular molecular pattern are able to start malignant growth or cancer.

Acquisition by the organism of certain hydrocarbons related to anthracene of coal tar has previously been defined as a condition which can lead to cancer. Already the ability of the newly produced chemical and five others to produce cancer in mice is being studied with the aid of the spectroscope.

Another line of attack is the investigation of chemical transformations of bile acids, sterols and sex hormones normally present in the body to determine whether any of these can be converted into cancer-producing substances like methylcholanthrene by processes akin to those metabolic processes that normally go on in the body.

Further attempts are being made to synthesize hydrocarbons likely to possess a still higher degree of cancer-producing activity, for this would still further facilitate animal studies and might reveal the nature of the cancer-producing activity.

ITEMS

CONSTRUCTION of the new Soviet stratosphere balloon "Osoviakhim–2" is progressing rapidly. While its crew of three men are yet unnamed, plans call for a period of parachute jumping for the appointees as training for the flight. The gondola of the balloon is being made from rustproof steel with welded joints. The gas bag will be fabricated from high grade rubberized muslin sewn together. The crew of three will consist of a commander, in charge of ground operations and gondola discipline; a pilot for navigating the balloon, and a scientific man for taking observations and operation of scientific instruments.

A SPECIES of the crustaceans at first known only from Honolulu has turned up on the coast of Natal, where it was identified by E. C. Chubb, curator of the Durban Museum. The wandering lobster, which has already half encircled the globe, was reported successively from the East Indies, from Reunion Island in the Indian Ocean, and from Mauritius. Zoologists are waiting now to see whether it will continue its journey around the Cape of Good Hope and into the South Atlantic.

FLORIDA'S picturesque Seminoles who hide in the lonely cypress swamps of the Everglades and live on their old-time diets have almost perfect teeth, according to information given to the Office of Indian Affairs. A dental survey of the 600 Seminole Indians in Florida has just been completed by Dr. Weston A. Price, of Cleveland. Those groups of Seminoles who have left the swamp land to live on the fringes of civilization and to enjoy its conveniences present an entirely different dental picture from the "wild" Seminole. Their contact with ways of civilized men have given them "an atrocious amount of dental decay."

WHAT fishes ate in the sea that once flowed where the mountains of West Virginia now stand has been the subject of study by Dr. Paul Holland Price, of the West Virginia Geological Survey. The answer is simple: they ate each other. Dr. Price has made a great collection of the undigested remains of meals eaten by the fishes of something well over a hundred million years ago in the rocks around Morgantown, W. Va. In these fossil lumps, known to geologists as coprolites, he has found evidences of bone and scale material, and not much else. In the same strata he has also found abundant fossilized fish scales.

BIRDS avoid butterflies whose bright coloration advertises their inedibility, according to a report in *Nature* by Professor G. D. Hale Carpenter, of Oxford University. He received the information on which he bases his communication from a naturalist in Africa, T. H. E. Jackson, of Kitale, Kenya Colony. On an expedition into Uganda, Mr. Jackson noticed birds feeding on butterflies that crowded among the flowers of a blossoming tree. Under the tree he found many wings of the insects, broken off by the birds before they swallowed their prey, some of them with the marks of beaks imprinted plainly on them. By comparing the numbers of these witnesses of insect tragedy with the relative abundance of the various species he could see in the tree, Mr. Jackson made an estimate of the feeding preferences of the birds. This estimate, he says, supports the idea that birds avoid colored butterflies.