

CHEMISTRY

Triple Weight Hydrogen Made From Deuterium Atoms

Existence of Third Isotope Proved by Mass Spectrographic Method; New Helium Now Sought

DIRECT proof of the synthesis of matter has been brought to light by the discovery of a new heavy, heavy hydrogen atom of mass three. The discovery resulted from experiments conducted by Drs. Gaylord P. Harnwell, Henry D. Smyth and Walker Bleakney, W. Wallace Lozier, P. T. Smith, S. N. VanVoorhis, and J. B. H. Kuper, of the Princeton University department of physics.

Through these experiments there have been found minute traces of this very heavy variety of hydrogen of mass three in a sample of almost pure hydrogen of mass two supplied by Prof. Hugh Taylor of the department of chemistry. The scientists were able to do this by using a mass-spectrograph of very high sensitivity recently constructed in the Palmer Physical Laboratory at Princeton by Drs. Bleakney, Lozier and P. T. Smith. This apparatus is capable of detecting one part of hydrogen of mass three in a million of mass two and in the sample analyzed actually recorded one part in two hundred thousand.

This experiment has served to prove the existence of this third isotope of hydrogen in a stable form in nature and has given an estimate of its abundance. Apparently it is present to less than one part in a billion of ordinary hydrogen.

Lord Rutherford and his associates at the Cavendish Laboratory in Cambridge, England, have obtained evidence that when two atoms of heavy hydrogen, which have a mass of twice that of ordinary hydrogen, strike one another with sufficient energy a process of atomic transmutation takes place. These two atoms of mass two probably coalesce into an unstable atom which flies apart, not as the two atoms of mass two from which it was formed, but as one atom of mass one which is ordinary hydrogen, and one of mass three which is a variety of hydrogen heavier than any previously known. The evidence for the existence of this third very heavy hydrogen has been of ex-

remely indirect nature until the completion of these experiments at Princeton. An experiment of the same nature as that of Lord Rutherford's has been performed by Drs. Harnwell and Smyth with the assistance of Drs. VanVoorhis and Kuper. Some hydrogen of mass two was bombarded for a considerable time by more of the same hydrogen and later the resultant mixture drawn off and analyzed in the mass-spectrograph by Drs. Bleakney, Lozier and Smith. It was found that after

PHYSIOLOGY

Yoga Rites Give Science New Facts About Breathing

SCIENCE has turned to the mysticism of India to discover new facts about breathing. For nearly two years a young Hindu graduate student at Yale University, K. T. Behanan, returned to his native India to subject himself to the practices of the cult of Yoga in the hope that psychology and physiology would be benefitted. In this scientific excursion into routine practices associated with mysticism Mr. Behanan had the guidance and cooperation of Dr. W. R. Miles of the Yale Institute of Human Relations. Dr. Miles and Mr. Behanan presented to the American Physiological Society preliminary results for the graphic pictures of these breathing patterns and careful determinations of the oxygen used by Mr. Behanan's lungs while he performed the intricate breathing exercises taught him by a noted Yoga practitioner.

Unusual breathing methods are a part of the rigorous religious regimen of the Yoga cult, which dates from the third century B.C. Extreme variations from ordinary breathing habits are learned by Yoga disciples and used daily for periods of from one to several hours.

Because peculiar breathing methods are not confined to these religious mys-

tics but are used in sports and industry, their physiological significance may have theoretical or even immediate practical application in our modern Western world. Pearl divers often are able to hold their breath for unusual lengths of time, over-ventilating lungs with unusual amounts of oxygen. Expert swimmers develop breathing rhythms that give them record-winning advantages.

This recent experiment is the first instance where any atomic species has been produced artificially in sufficient quantity to analyze and detect by other than radioactive means. The continuation of this work is being undertaken by Drs. Harnwell and Smyth with the purpose of producing larger quantities of this heavy hydrogen and of attempting to detect by the same method a second possible variety of helium of mass three instead of the ordinary sort with mass four.

Dr. Bleakney reported the discovery to the American Physical Society meeting at Washington.

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Kapalabhati, Ujjayi, and Bastrika were three of the breathing exercises learned by Mr. Behanan and practiced by him for twenty months of adherence to the Yogic routine.

The Indian mystics use Yoga breathing exercises in order to induct themselves into the proper physiologic state for beginning their particular type of religious contemplation.

Physiologists were interested in Dr. Miles' report that the oxygen consumption of Mr. Behanan during the Yoga breathing was increased about twenty per cent. over that of his ordinary breathing. This was followed by a reduction of about four per cent. during 15 to 20 minutes succeeding the exercise. This Yogic breathing was at the rate of one breath per minute or slower.

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