CHEMISTRY

Nobel Chemistry Award For Discovery of Deuterium

Young Physical Chemist, Working With Two Youthful Colleagues, Brings to America Second Science Honor

See Front Cover

THE 1934 Nobel Prize in chemistry was awarded to Prof. Harold C. Urey of Columbia University in recognition of his part in the discovery of heavy hydrogen (deuterium). Since the 1934 physics prize and the 1933 chemistry prize unawarded last year are not to be given this year, all of this year's science Nobel awards are to be conferred on Americans. The prize in medicine went to the Americans who developed liver therapy for pernicious anemia, Drs. G. H. Whipple, George R. Minot and William P. Murphy.

Prof. Urey is only 41 years of age and he is professor of physical chemistry at Columbia. He discovered heavy hydrogen in 1931, in collaboration with Dr. F. G. Brickwedde of the National Bureau of Standards and Dr. G. M. Murphy of Columbia University.

Research on the heavy isotope of hydrogen and its compound with oxygen, heavy water, has filled the journals of chemistry and physics. So much research has been under way, and so fast have new discoveries been made, that the National Research Council recently formed a committee to serve as a clearing house for research information in this field. Prof. Urey is chairman of this committee.

Early this year Prof. Urey was awarded the Willard Gibbs medal, another high scientific honor.

Science News Letter, November 24, 1934

CHEMISTRY

Heavy Hydrogen's Great Use Is Tracing Atoms

By DR. HAROLD C. UREY, Nobelist in Chemistry, 1934

THE importance of heavy hydrogen, or deuterium, to chemistry lies in the fact that it enables scientists to trace the course of chemical reactions, and also enables them to check theoretical calculations on chemical reactions, particularly as they deal with the effects of the mass of atoms.

To physics, deuterium is important because it provides physicists with a new atomic nucleus for use in experiments on the bombardment of the atom, in which some of the secrets of atom nuclei can be learned.

Since living things live essentially in a water solution, and all—man, animal and plant—are composed so largely of hydrogen compounds, deuterium is, of course, very important to the biologists.

Science News Letter, November 24, 1934

GENERAL SCIENCE

We Nominate— For Future Halls of Fame

THIS being the time of year when Nobel prizes are being awarded, the temptation to list notable science achievements of the past few years is too great to resist.

We nominate for future halls of fame:

The discovery of heavy hydrogen or deuterium, by Dr. Harold C. Urey of Columbia University, Dr. F. G. Brickwedde of the National Bureau of Standards, and Dr. G. M. Murphy of Columbia University now honored by the Nobel prize in chemistry for 1934.

The discovery of artificial radioactivity by Prof. F. Joliot and Irene Curie-Joliot, Parisian husband and wife research team.

The discovery of the positron or positive electron by Dr. Carl D. Anderson of California Institute of Technology.

The discovery of the neutron by Dr. J. Chadwick of Cambridge.

The development by Dr. William P. Murphy of Boston and Dr. Guy W. Clark of Lederle Laboratories of a potent liver extract, one injection of which monthly will control pernicious anemia.

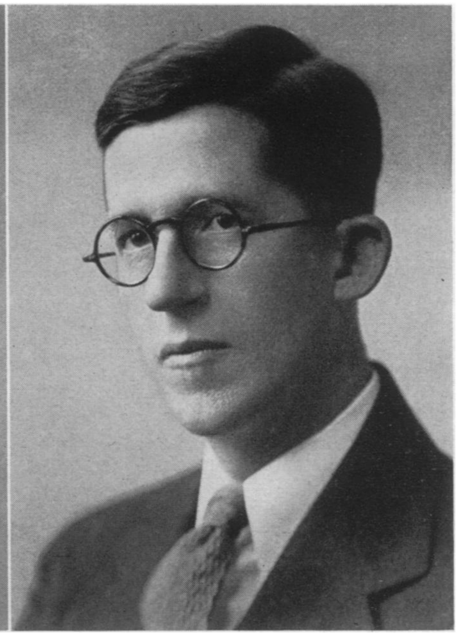
The award of the 1934 Nobel prize in medicine for liver therapy for this disease to Dr. George H. Whipple of Rochester, N. Y., Drs. George R. Minot and William P. Murphy of Boston.

The successful transplantation of parathyroid and thyroid gland tissue by Drs. Harvey B. Stone, J. C. Owings and George O. Gey of Johns Hopkins.

The exploration of those bearers of heredity, the genes, within the chromosomes, an epic of biological research in which a half-dozen scientists in America and abroad have participated.

The demonstration by Dr. Leonard

DR. F. G. BRICKWEDDE



DR. G. M. MURPHY

Science Service, Inc. is collaborating with JSTOR to digitize, preserve, and extend access to The Science News-Letter. www.jstor.org

G. Rowntree of Philadelphia that the hormone of the mysterious thymus gland visits precocity on future generations.

The development of improved television apparatus, iconoscope and kinescope, by Dr. V. K. Zworykin of Camden, N. J.

The application of the experience of automotive and aeronautical engineering to railroading, resulting in the development of high speed trains of a new mechanical breed.

The adding of 75 miles per hour (60 per cent.) to the speed of transport airplanes without requiring additional power, which came largely as the result of application of National Advisory Committee for Aeronautics research on engine location, cowling and wing sections.

The aluminizing of astronomical mirrors, replacing silvering, with the result that shorter wavelengths of light from the heavens can be caught and studied.

Science News Letter, November 24, 1934

CHEMISTRY

Hydrogen's Heavy Twin Has Already Had Romantic Life

By WATSON DAVIS

Extracts from Chapter 7 on Heavy Hydrogen in "The Advance of Science" (Doubleday, Doran)

IF IT WERE discovered that some substantial citizen of the world was actually twins and one of these twins was twice the weight of the other although they had passed for each other to all who knew them, there would be created in everyday life a situation such as confronted the chemists and physicists when in 1931 the twin nature of hydrogen was discovered. For hydrogen is one of the most substantial of chemical elements, more important perhaps than any other except carbon.

The discovery of a heavy kind of hydrogen, about twice the weight of ordinary hydrogen, has stirred scientists to a high pitch of intellectual excitement. It is more important than any of the recent isolations or discoveries of new chemical elements. It is even now ranked "among the great discoveries of science." It is the starting point in developing a far-reaching new field in chemistry.

Discovering Deuterium

Deuterium, as the heavy hydrogen has been christened, has started a fever in the chemical laboratories of the world. It has reoriented research programs, sidetracked less promising researches, and caused a rush to print that has filled the announcement columns of the chemical and physical journals. Whereas water was just water a few months ago, there is now heavy water, distinctly different from ordinary water. And there are actually nine chemical kinds of water. Biologists have joined in the race, to discover the effect of deuterium in heavy water upon living things.

"Urey, Brickwedde, and Murphy" is the way in which the scientific literature cites the research team that discovered heavy hydrogen. They are three young scientists, who were 38, 28, and 26 years old in 1931 when they acted as obstetricians to hydrogen's fission.

Predicted by Theory

Prof. Urey himself had speculated on the existence of double-weight hydrogen (and also triple-weight hydrogen and quintuple helium) after he had compared the proton and electrons in the kernels of the elements lighter than oxygen and had come to the conclusion that there was a place for more than one kind of hydrogen in the scheme of elemental things. By one of the coincidences that happen in science as elsewhere, Prof. Herrick L. Johnston of Ohio State University came to the same conclusion, and his predictive paper was printed by the side of Urey's in the same number of the *Journal of the American Chemical Society.* (*August,* 1931)

Acting upon Birge and Menzel's suggestion that there might be in ordinary hydrogen gas one part of hydrogen isotope 2 to 4,500 parts of mass one hydrogen atoms, Urey, Brickwedde and Murphy decided that the best way of concentrating the heavy isotope would be to take a quantity of ordinary hydrogen gas, liquefy it, and then evaporate all but a few drops of it. The heavy hydrogen would remain mostly in the last few drops. These drops were sealed into glass bulbs by Brickwedde in Washington and sent to Urey and Murphy in New York.

The spectrograph, that useful analyzer of the rainbow of light emitted by the intense activity of the atoms, was called into service. The little ampule of hydrogen gas, in which the experimenters confidently hoped they would find heavy hydrogen, was subjected to electrical discharge. In the way the light was emitted Urey and Murphy found telltale spectral "flags" which proved the existence of heavy hydrogen.

The Race for Heavy Water

With the existence of deuterium conclusively demonstrated, there was the great urge to get it isolated in such purity as to see whether it was markedly different from ordinary hydrogen. Dr. E. W. Washburn, chief of the U. S. Bureau of Standards, division of chemistry, who died early in 1934 in the midst of intensive research on deuterium, suggested and put into practice the method of separating deuterium by electrolysis. In the industrial plants that make oxygen and hydrogen gases by breaking up water with an electric current, Dr. Washburn found the first step in electrolytic separation already accomplished. The water in commercial electrolytic cells that have been operated for long periods was markedly richer in the heavier deuterium than ordinary tap water. The lighter kind of hydrogen had a tendency to go off as gas first when the water was broken up into its hydrogen and oxygen by the electricity. Further electrolysis of the water rich in deuterium gave what was, up to that time, the world's heaviest water.

Costlier Than Gold

Just what these figures, that differ markedly from the standard values accepted for water, mean, will be realized when it is remembered that water is the substance widely used in setting the standard values for freezing point, boiling point, and other physical constants.

Like any rare substance, the cost of heavy water was at first high. About the middle of 1933, 95 per cent. heavy water was valued at $150 a gram, $150,000 a quart. Early in 1934, Princeton University scientists produced it at an estimated cost of $5 a gram. With methods already developed, it can probably be produced in quantity at from $1 to $2 per gram, a figure that is higher than the 1934 price of gold. Compared with its early production costs of one-