that the mass of this isotope is 3.0165. It is quite likely that the helium nucleus of mass 3 formed in this way is unstable and may possibly break up into H^3_1 and a positive electron. While the conclusions outlined above are to some extent provisional and require confirmation by other methods, there can be no doubt that the effects which follow the collisions of a swift diplon with another are of much importance and interest in throwing light on possible modes of formation of some of the lighter nuclei.

It is of interest to speculate why the heavy isotope of hydrogen appears in many cases far more effective for equal energies in producing transformations than the lighter isotope. On the general theory of transformation proposed some years ago by Gamow, it is to be anticipated that for equal energies of motion the diplon, on account of its heavier mass, would have a smaller chance of entering a nucleus than the swifter proton. It may be, however, that normally only a small fraction of the protons which actually enter a nucleus is able to cause a veritable transformation, the others escaping unchanged from the nucleus. On this view, the greater efficiency of the diplon in causing transformation may be due to the fact that a much larger fraction of those which enter the nucleus are retained by it, leading to a violent disintegration of its structure. It may be too that the diplon on entering a nucleus breaks up into its component parts. The appearance of the proton as well as the neutron in some of the transformations may be connected with the composite structure of the diplon.

In this address I have endeavored to give in a simple way an account of our knowledge of heavy hydrogen which has been gained in the past year and to indicate the great importance of this discovery to science. This new hydrogen will undoubtedly prove of great value in many ways to physics and chemistry and probably also to the biological sciences. There are already indications that much interesting information may be obtained by the application of this new substance to the study of processes in animal and plant life.

In the course of the lecture, experiments were shown to illustrate the differences in freezing point and in vapor pressure between ordinary and heavy water, and the differences in heat conductivity between ordinary and heavy hydrogen. For the first time experiments were made to show the artificial transformation of lithium by protons and diplons of energy corresponding to about 100,000 volts. The enormous emission of fast protons when ammonium sulfate containing heavy hydrogen was bombarded by diplons was clearly shown by counting methods. The transformation apparatus was designed and operated by Dr. Oliphant, while Messrs. Watson and Sons loaned an installation to provide a steady potential of 100,000 volts to accelerate the ions.

OBITUARY

GEORGE CARY COMSTOCK

WHEN a man maintains his strength and his faculties unimpaired up to the age of nearly fourscore, and then is taken suddenly with no long drawn-out illness, we feel that his life was arranged about right. George Cary Comstock was born in Madison, Wisconsin, on February 12, 1855, and died in the city of his birth on May 11, 1934. Thus closed a career which for long was associated with the old-time "astronomy of precision."

Comstock spent his youth and prepared for college in the state of Michigan. Entering the university at Ann Arbor, he took a scientific course and was graduated in 1877. While at Michigan he came under the tutelage of Professor James Craig Watson, who was to influence his whole later life. It was in 1854 that the German astronomer Francis Brünnow was called to Michigan. Trained in the traditions of his home institutions Brünnow carried to a mid-western college the methods of a German university, and lectured in broken English to diminishing classes until Watson was his only student. Yet there were developed by Watson, who ultimately succeeded Brünnow, and the others at Michigan perhaps half of the trained astronomers of America during the seventies and eighties, and one of the foremost of the group was Comstock. After several years as a civil engineer it was in 1881 that Comstock followed Watson to Wisconsin to be assistant in the Washburn Observatory. Then, after Watson's premature death, Comstock served at Madison under Edward S. Holden, later the first director of the Lick Observatory. As a career in astronomy involved considerable uncertainty, Comstock devoted his spare time to the study of law; he was graduated from the Wisconsin law school in 1883, but he never practiced. Nevertheless, he later often referred to his legal training as possibly the most valuable part of his education.

At the age of thirty he was definitely committed to an academic career by an opening at Ohio State University, where he served as professor of mathematics for two years. In 1887 when Holden left to take up active service at the Lick Observatory it was President T. C. Chamberlin who called Comstock to take charge of the Washburn Observatory. Watson and Holden had already given it a place of distinction in their science quite beyond that which would ordinarily be reached by a small observatory, and during the following thirty-five years Comstock maintained the quality of its work, both as its principal observer and as its administrator.

Throughout his scientific activity Comstock held an unusually happy balance between theory and practise. Though the observational astronomy of his early days consisted essentially of the visual measurement of angles he never became a routine observer. As a substitute for the meridian circle he adopted Loewy's method of placing a prism in front of a telescope, and by observing simultaneously stars separated by arcs of 120° the measures could be carried round the sphere in three steps, with the advantage that the quantities actually measured were small angles rather than large ones. From this work there resulted one of the best determinations of the constant of aberration ever made.

Comstock developed a simple formula for the amount of the atmospheric refraction which replaces in many cases the complicated procedure necessary for its evaluation. His measures of double stars were continued more than thirty years; the quality of his observations was always of the highest, exemplifying the statement that "the precision of a double-star measure bears no direct relation to the size of the telescope with which it is made." He contributed new methods of determining binary orbits, but the chief outcome of the double-star work was the detection of proper motions of faint stars. One high authority on double stars had stated that there was yet to be brought forth any evidence of the proper motion of a really faint star, but Comstock demonstrated that stars as faint as the twelfth magnitude do move enough to be detected. By the remeasurement of faint companions of bright double stars, observed incidentally by the Struves and others early in the nineteenth century, he found that, when the known motions of the bright stars were allowed for, the remaining discrepancies were due to the motions of the faint ones. This conclusion was confirmed by a determination of the sun's way from the motions of the faint stars alone. From the average apparent motion of these stars, some five or six times fainter than had been previously studied, it was evident that they were nearer to us than would be inferred from their apparent brightness. Comstock gave two alternatives —either there is an appreciable absorption of light in space or the stars which he studied are intrinsically fainter than the bright ones. The second alternative has turned out to be the correct one, and the great preponderance of stars of low intrinsic luminosity in a given volume of space, which his work foreshadowed, has been amply confirmed in recent years.

Although Comstock held what was essentially a research position, he was an inspiring teacher of the few who came to study with him, due in large part to his mastery of clear and apt expression. In private conversation, in the classroom or at larger gatherings there was never any doubt of the meaning of his words, and the ease and finish of his speech was a source of constant admiration to his listeners.

One of the important measures of the first year of the administration of President Van Hise at the University of Wisconsin in 1904 was the definite organization of the graduate school. He selected Comstock to be the head of the school, and placed on him the task of working out the problems of a new division of the university, one that was growing rapidly both in size and in importance. He held this position until 1920, as chairman, director and dean; showing in it his qualities of quiet efficiency and breadth of view. He received a school without definite organization and with about 150 students; he left it fully organized for teaching and for research and with its number nearly quadrupled. The duties of the graduate school naturally interfered with his scientific work during the later years, but on relinquishing the deanship he continued active and finished and published the researches on which he had been long engaged.

Comstock received, as was his due, many honors from his fellows. He was a member of the National Academy of Sciences and of numerous other societies in this country and abroad. He was active in the organization of the American Astronomical Society and served for ten years as its first secretary; he was later recalled from retirement to be its president.

He retired from university service in 1922 and had the happiness of twelve years of active and interested leisure; and the satisfaction of seeing the continued progress of the university and the departments with which he had been connected.

JOEL STEBBINS

SCIENTIFIC EVENTS

INTERNATIONAL CONFERENCE ON PHYSICS[1]

A MEETING of the International Union of Pure and Applied Physics will be held in October next in London and a joint conference will be held with the Physical Society, under the presidencies of Professor R. A. Millikan and Lord Rayleigh. The last meeting of the Union took place in 1931 at Brussels, when an invitation from the Royal Society to meet in London

[1] From *Nature*.