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OF

FRANK WIGGLESWORTH CLARKE

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BY

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Frank Wigglanthe Clarke

FRANK WIGGLESWORTH CLARKE

March 19, 1847, to May 23, 1931

BY L. M. DENNIS

Some two centuries ago, Robert Clarke, a member of the Scotch colony near Londonderry, Ireland, came to this country and settled in Londonderry, New Hampshire, about 1725. A grandson of Robert, Samuel Clarke, was a Unitarian Minister located first at Princeton, and later at Uxbridge, Massachusetts. A son of Samuel Clarke, Henry W. Clarke, married Abby Fisher, and their son, Frank Wigglesworth Clarke, the subject of this memoir, was born in Boston on March 19, 1847. Professor Clarke's grandmother on his father's side was Sarah Wigglesworth, granddaughter of Col. Edward Wigglesworth of Washington's army, and great-great-granddaughter of Michael Wigglesworth, the author of the "Day of Doom," a Puritanical poem that was popular in the 18th century. Michael was descended on the mother's side from Anthony Fisher, who settled in Dedham, Massachusetts, about the middle of the 17th century.

Professor Clarke's father, Henry, was first a hardware merchant in Boston, and later a dealer in iron-working machinery. His mother died when he was about ten days old, and Clarke's earliest childhood was spent with his grandfather at Uxbridge. In 1851 his father married again and lived for about eight years in Woburn, ten miles from Boston. He later removed to Worcester, but returned to Boston in 1866, making it his home in the suburb of Watertown, where he resided until his death in 1907.

From 1857 to 1869 Frank's time was mainly divided between his father's home and that of his grandmother Fisher in Boston. As a result of this frequent moving about, his early education was disconnected. He began his regular schooling in Woburn, was then for sometime at Uxbridge, and following a year or two in a boarding school at Stoughton, Massachusetts, he attended several different schools in Boston. After a year in the Boston Latin School he went to the English High School, and in March 1865 he entered the Lawrence Scientific School of Har-

vard University, where he took up the study of Chemistry under Wolcott Gibbs, receiving the degree of B. S. in 1867.

But as Professor Clarke was wont to say, "formal schooling is only a small part of education." He learned to read before he went to school, and he thought that he picked up his letters from blocks that had been given to him for playthings. Even before entering his first school at Woburn he was reading Robinson Crusoe and the Arabian Nights. He recalled that at Woburn he was particularly interested in Colburn's mental arithmetic, from which he derived valuable training. Problems were given out which had to be clearly stated by the student and then orally solved in a logical manner. Clear reasoning was required, and he felt that that training stood him in good stead throughout his life. He was early interested in geography, but he greatly disliked the study of grammar, although he was a very accurate speller, an accomplishment that he thinks was developed by his omnivorous reading, in which he was later given opportunity to indulge through access to the public library in Boston.

Like all healthy boys he greatly enjoyed outdoor sports, such as swimming, boating, and fishing, and he early developed the collecting instinct, being interested in coins, pressed flowers, and especially in minerals. His interest in minerals seems to have dated from the time when a visitor at his grandfather's gave him a pebble of chlorastrolite. This was the beginning of a small mineral collection and his interest in mineralogy. As a youth he visited the well-known mineral deposits at Lancaster and Bolton, Massachusetts, and on this and other excursions he learned much concerning the natural occurrences of minerals.

His interest in chemistry seems to have sprung from the perusal of a copy of "The Boys' Own Book" which was given to him when he was about eleven years old. The section on chemical experiments fascinated him, and a few years later, in association with some of his playmates, he got together a small supply of cheap apparatus and chemicals with which they had, as he expressed it, some successes and many failures. But in this boyish study he acquired some knowledge of manipulation of apparatus which was of value to him when he later entered the Lawrence Scientific School.

Allied to his interest in making collections of specimens was his bent for arranging his information in tabulated form. When he was about eight years old he was given a copy of Mayne Reid's "Boy Hunters" in which many birds and plants were described. Fascinated by their names, he carefully tabulated their characteristics without any suggestions from older people. This instinctive urge to tabulate data led in later days to the production of some of his most important and valuable scientific work.

After graduation from the Lawrence Scientific School in 1867, he remained there for an additional year to carry on research, and in March 1868 he published his first scientific paper, "A New Process in Mineral Analysis." During that year he also lectured on chemistry in the newly established Boston Dental College. In January 1869 Clarke went to Cornell University as assistant to Professor J. N. Crafts and remained there until the close of the academic year. While at Cornell he found much pleasure in exploring the many ravines near Ithaca and wrote a guide book to that region which was published by a local concern. He also there worked out an excellent method for separating tin from antimony.

The next four years were spent in a rather itinerant manner—lectures in the Boston Dental College, in a private school, and in some popular courses, reporting Tyndall's Lowell Institute Lectures for the *Boston Advertiser*, journalistic work, articles to several magazines, and occasional verses—anything to add to his small income.

He did not, however, neglect his scientific work. In 1873 he wrote for the *Popular Science Monthly* an article entitled "Evolution and the Spectroscope," pointing out that the evolution of planets from nebulae had been accompanied by the evolution of the chemical elements from their simplest forms. A "Table of Specific Gravities, Boiling Points, and Melting Points of Solids and Liquids" was accepted for publication by Joseph Henry, Secretary of the Smithsonian Institution, who made it the first of a series of articles to which he gave the name "Constants of Nature." This was later followed by other similar tables, several of them by Clarke, and one by G. F. Becker. In 1873 he

received appointment, largely through the influence of Professor Henry, to the Professorship of Chemistry, Physics, etc., at Howard University in Washington. In the following year he married Mary P. Olmsted, of Cambridge, Massachusetts, and in September he went to the University of Cincinnati as Professor of Chemistry and Physics, where he remained for nine years.

At Cincinnati his duties at first were largely routine, but he soon equipped a small but satisfactory laboratory and published several investigations. It was while there that he wrote his noteworthy article on the "Recalculation of the Atomic Weights" which appeared as one of the series of the "Constants of Nature" of the Smithsonian Institution.

In 1883 Clarke was appointed Chief Chemist to the United States Geological Survey at Washington, and Honorary Curator of Minerals of the United States National Museum, and these positions he held until his retirement on December 31, 1924.

The work in the Survey was of the most varied character, comprising many routine analyses to assist geologists, analyses of waters of the Yellowstone Park, and of igneous rocks and rare minerals. Personally he carried out investigations in the field of Geochemistry, and he always regarded his researches in this field as his most important scientific contributions. The results were summarized in his volume "The Data of Geochemistry," which ran through five editions issued as Survey Bulletins.

Apart from his regular duties as Chemist for the Survey, Clarke was called upon for service in connection with the government exhibitions at several expositions, and at the close of the Paris Exposition in 1900 the French Government awarded him the decoration of chevalier of the *Legion d'Honneur*.

In 1903 the centenary of Dalton's Atomic Theory was celebrated at Manchester, England, and on that occasion Clarke delivered the Wilde lecture and received the Wilde medal. In 1909 he delivered before the Chemical Society of London a lecture in memory of Wolcott Gibbs, his former teacher. Many universities conferred upon him honorary degrees and he was associated, either as member or as honorary member, with many scientific societies in this country and in Europe.

Not long after the appearance of the first edition of Dr. Clarke's "Recalculation of the Atomic Weights," three similar but less complete revisions were published in Europe, by Meyer and Seubert and by Ostwald in Germany, and by Sebelin in Norway. The American Chemical Society, recognizing the fundamental importance, both to scientific research and to the chemical industries, of correct data concerning the atomic weights of the elements, appointed Dr. Clarke a committee of one to prepare an annual report on the subject, and annually to compile a table of atomic weights for official use in this country. His first report was presented to the Society at the Baltimore meeting in December, 1893. In 1897 the need for an official table of atomic weights for German analysts was brought before the German Chemical Society, and a committee of three, Landolt, Ostwald and Seubert, was appointed to consider and report upon the question, which they did on October 31, 1898. They used Oxygen = 16 as the basis for the atomic weights, a value that Clarke had provisionally adopted for his table of 1893. In their report Landolt called attention to the desirability of international agreement concerning these values, and the German Committee issued on March 30, 1899 an invitation to the Chemical Societies and similar organizations of the United States and the leading countries of Europe to nominate members of an International Committee. The Committee thus created consisted of more than fifty members, the representatives of the American Chemical Society being J. W. Mallett, E. W. Morley, T. W. Richards, E. F. Smith, and F. W. Clarke, Chairman.

It was soon found that this large committee was too unwieldy for efficiency, for its work had to be carried on by correspondence which caused long delay in the preparation of its report. For this reason the members of the Committee from the German Chemical Society addressed to the members of the large Committee the question as to whether the periodic preparation of a table of Atomic Weights should be placed in the hands of a much smaller committee. The answers to this inquiry being strongly in the affirmative, the members were asked to send in nominations for a committee of three. Those receiving the highest number of votes were F. W. Clarke, America, T. E.

Thorpe, England, and K. Seubert, Germany. Clarke was asked to act as chairman of the committee, a position that he held until 1918 when the World War caused the temporary discontinuance of the International Committee.

One of Dr. Clarke's greatest services to chemistry in this country was in connection with the creation of the American Chemical Society. Up to 1873, chemistry had been given but scant attention in the meetings of the American Association for the Advancement of Science. In that year, at the meeting at Portland, Maine, four young men, C. E. Munroe, W. McMurtree, H. W. Wiley and F. W. Clarke, presented a request that chemistry be more adequately recognized by the formation of a subsection of chemistry, now Section C. The request was granted, and the section held a successful meeting at Hartford in the following year. In 1876 the chemists of New York City organized a local society to which they gave the name American Chemical Society, and some eight years later another local society of chemists was formed in Washington. The American Association met at Cleveland in 1888, the chairman of the chemical section at that time being Dr. C. E. Munroe. Dr. Clarke wrote to him and suggested the formation of a really national Chemical Society. Dr. Munroe favored the idea, and after some three years of discussion of the project, in which Dr. Clarke took an active part, a compromise proposal of the New York Society was adopted. This was, that if the chemists of the country would accept the name and charter of the New York organization, that society would form a local section of a truly national society, the Washington society to take the same action. This national society has now become the largest chemical society in the world, with eighty sections and nearly 19,000 members. Dr. Clarke was elected to the presidency of the society in 1901.

The numerous articles from his pen upon a wide variety of subjects that appeared in divers journals and magazines furnish abundant evidence of the breadth of his interest and the scope of his knowledge and of his gift of felicitous and convincing expression.

He was one of the most kindly and lovable of men, simple in his tastes and modest and unassuming. His sense of humor and ready wit gave to his conversation a delightfully piquant flavor and it was a most entertaining experience, which the writer often had the privilege to enjoy, to listen to his reminiscences, sometimes keenly critical, sometimes highly amusing, but always sympathetically appreciative, of the noted men whom he had known and of their scientific work. His was a long life, a happy and useful life, a life of helpfulness to others and of high achievement.

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FRANK WIGGLESWORTH CLARKE

COMPILED BY LUCIA K. WILLIAMS

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