

OBITUARY.

WILLIAM EBENEZER FORD.

William Ebenezer Ford, mineralogist, was born in Westville, a suburb of New Haven, Connecticut, on the 18th of February, 1878. He was the son of William Elbert and Caroline Aby (Bishop) Ford. He attended the local schools and prepared there for college; and, entering the Sheffield Scientific School in the fall of 1896, graduated in June 1899. Following his graduation, he was appointed assistant in mineralogy to Prof. Samuel L. Penfield, under whom he also carried on post-graduate studies in mineralogy and crystallography. In 1903 he received the doctorate and was thereupon appointed instructor in mineralogy. Professor Penfield's health failed him in the spring of 1900, and, although he was able to direct the research work of advanced students, the routine class work was in that year carried on by the writer, who was then serving as instructor in mineralogy. It is a pleasure to him to recall that Mr. Ford assisted him most efficiently in these duties. Although Doctor Penfield's health improved, the routine work of teaching was carried by Mr. Ford. In 1906, shortly before the lamented death of Doctor Penfield, Mr. Ford was promoted to be assistant professor of mineralogy. In 1920 Mr. Ford was made professor of mineralogy and a member of the Governing Board of the Sheffield Scientific School, which position he held until his death in March 1939.

In 1920 he married Mary Treat Jennings of Rochester, New York, who survives him. Both he and Mrs. Ford enjoyed entertaining their many friends and extended a delightful hospitality both at their home on Lincoln Street, New Haven, and, in the summer, on the Cape where they had a cottage. Mr. Ford was very fond of music, and was himself an accomplished pianist.

Ford was always an effective and successful teacher, and his courses were deservedly popular. His pleasantly informal and friendly manner of handling students, and the large amount of personal attention which he gave them, seldom failed to arouse a genuine interest in the subject he taught, which often continued in after years quite irrespective of the student's particular occupation in life. He was always interested in their personal problems and perplexities, and was regarded with an unusually warm and lasting personal affection by all of his students.

As might be expected of one trained under Doctor Penfield, Mr. Ford's scientific work was characterized by meticulous and thorough investigations covering the morphological, physical and chemical properties of minerals. Although he did not possess the almost uncanny skill and ingenuity as an analyst that was Penfield's, he

had a thorough knowledge of chemistry and was successful in associating with himself in his laboratory several men, like Dr. Walter Bradley, who were accomplished analytical chemists, and he used the results of their work most effectively. Almost without exception, the results of his investigations were published in *This Journal*. His first paper (with Penfield) appeared during his first year of post-graduate study, and during the next twenty years he was the author, sometimes in collaboration with his associates, Dr. Walter Bradley or others, of upwards of thirty papers.

Among the more important of these may be noted one published in 1913 dealing with the optical properties of the amphiboles. Another paper appeared a year later which represented an exhaustive study of the garnet group. A third paper of note was a similarly thorough study of the rhombohedral carbonates. All three of these papers constituted valuable additions to our knowledge of important minerals, and all were primarily concerned with studying the relations existing between the chemical composition of the members of isomorphous mineral compounds, and their physical properties. The first one cited, that on the common amphiboles, was a completion and extension of an investigation begun by Doctor Penfield and F. E. Stanley. While the complexity of the chemical composition of members of this group of minerals made any very definite conclusions regarding the relations between the chemical composition and the physical properties impossible, he was able to show some degree of correlation between the mean indices of refraction and the percentage of the principal oxides present; there also appeared to be some correlation between the amount of total iron present and the value of the extinction angle. In his study of the garnet and calcite groups, respectively, he determined the approximate degrees of miscibility which the various mineral molecules exhibited, and showed that there existed a fairly close correlation between the chemical composition of a given isomorphous mixture, the index of refraction, and the specific gravity. He represented these relationships in a series of diagrams from which, if the values of two of these properties are known, the third can be determined with some accuracy.

At the time when the paper on the rhombohedral carbonates was being prepared, the results of Bragg's x-ray determination of the size of the unit cell and the atomic structure of calcite was available, and it was known that the crystal structure for dolomite, siderite and rhodochrosite must be of the same sort as that of calcite. Mr. Ford discussed this with special reference to the effect of isomorphism on the crystal lattice. He concluded that the lattice for all members of the group and their mixtures remained the same or at most with very small variations insofar as the atomic arrangement and crystal angles were concerned; that the only variation must

therefore be in the spacing of the molecular layers which would of course involve a change in the volume of the unit cell. "Complete isomorphous replacement in all proportions would only be expected in the case of two molecules having naturally identical space lattices or with lattices that may change progressively from one end of the series to the other. In other instances the amount of replacement would be conditioned upon the similarity between the two lattices and would proportionally diminish in amount as this similarity decreased." His assembled data seemed to conform well with this theory.

For some years before the publication of the calcite paper in 1917, Mr. Ford had devoted much of his time to the work of editing and revising the Dana texts on mineralogy, and as time went on he gave almost his entire attention, not devoted to teaching, to such work. In 1911 the second appendix to Dana's *System of Mineralogy* was published by Mr. E. S. Dana and Ford, and the third appendix—1915—was entirely Ford's work. He was also the author of the revision of the 13th edition of Dana's *Manual of Mineralogy* published in 1912. In 1922 appeared under his authorship the third and revised edition of Dana's *Textbook of Mineralogy*; in 1929 appeared the 14th edition of the *Manual*; and in 1932, the very largely rewritten and much enlarged 4th edition of the *Textbook*. In particular, in this edition he had expanded and brought up to date the part dealing with crystallography, including a chapter on crystal structure.

The very great additions, both factual and theoretical, to mineralogical science that had been made since the publication of the sixth edition of Dana's *System of Mineralogy* in 1892, even with the supplement and the three appendices that had been issued up to 1915, demanded attention if the *System* were to maintain its position as an up-to-date book of reference. The preparation of a further appendix seemed quite inadvisable, and accordingly Mr. John Wiley of the Wiley firm which had published the Dana texts over a long period of time proposed to Mr. Ford the project of preparing a new and complete revision of this great work. Mr. Ford agreed to act as editor-in-chief, and began in 1920 to lay out and organize the work and to collect material. Be it said to Mr. Wiley's credit that it was because of his very real desire to make an important contribution to mineralogy and geology, in which fields of publication his firm had for so long been prominent, that he was led to propose this project. He had no thought that it would be a financially profitable venture. Indeed, it was likely to be quite otherwise, for it involved, besides the high cost of publication of a book of this type, the employment under the chief editor of other highly trained experts, and the certainty of a relatively limited market for its sale.

Mr. Ford associated with himself from time to time several men with chemical and mineralogical experience, and more particularly had secured the coöperation of Dr. Charles Palache of the Harvard laboratory to supervise the revision and expansion of the crystallographic part of the work. Considerable progress had been made in this really tremendous piece of work when Mr. Ford's health began to fail him, and he realized that additional assistance must be had if the work was to be carried on. He and Doctor Palache made an appeal to the Geological Society of America for aid and received a generous response in the way of a substantial grant of money. About two years ago Mr. Ford, because of his poor health, was obliged to turn the entire project over to Doctor Palache. While it was a great and bitter disappointment to Mr. Ford to have to relinquish a piece of work which he felt was to be the climax of his life's work at the Yale laboratory, he took comfort, as did all with a genuine interest in mineralogy, that the work of preparing the new edition of this standard work should fall to the most capable of all men for the task, Doctor Palache.

Besides his many investigations dealing with individual minerals and mineral groups, the contribution to mineralogical science for which Doctor Ford will be best and most gratefully remembered by teachers and students of the subject will be the valuable service which he rendered with such untiring patience and skill in editing and revising a series of texts that are widely used the world over wherever mineralogy is studied.

CHARLES H. WARREN.