WILLIAM FRANCIS HILLEBRAND

DR. WILLIAM F. HILLEBRAND, chief chemist of the United States Bureau of Standards, died on the afternoon of February 7, 1925. The immediate cause of his death was heart failure, the remote result of a serious case of pneumonia from which he suffered several years ago. His loss is most keenly felt by all his associates at the Bureau of Standards and his many friends in Washington. He leaves a gap in the ranks of chemists that will not soon be filled. He is survived by his widow and his two sons, William Arthur, electrical engineer of Palo Alto, California, and Harold Newcomb, professor of English in the University of Illinois.

Dr. Hillebrand was born in Honolulu, December 12, 1853. His father was not only a physician but a distinguished authority on the botany of the Sandwich Islands. The old home grounds, a veritable botanical garden, is to this day one of the show places of Honolulu. These surroundings of his earliest days, with visits to China, Java and India, and his life for a time in California implanted in him a deep interest in nature which he kept to the last. After he became chief chemist of the Bureau of Standards he moved to Cleveland Park, a suburb half a mile from the laboratories. There he had a garden in which he experienced the usual pleasures and disappointments of those who delve in the soil. As long as his eyesight permitted he frequently carried a bird book on his way through the woods to and from the bureau. He was an ardent angler for small-mouthed black bass, but took little interest in other fishing, at least in his later years. He was evidently much chagrined in the summer of 1923, but said little about it, to find that he was unequal to the exertion of trout fishing in Estes Park, Colorado.

Among his diversions were an afternoon at a baseball game or an evening playing skat. He enjoyed good music, and evening visitors at his home would sometimes find him seated at the piano. Philately was a hobby he gave up in his later years. One of his greatest pleasures was reading all manner of books. Only a month before his death he read for the first time Needler's translation of the Nibelungenlied, his first real acquaintance with that classic.

Strange to say, Dr. Hillebrand did not at an early age display any inclination toward the study of chemistry. Not until 1872, after two years at Cornell University, did he decide to become a chemist, and then only because it was suggested to him as a subject of interest and importance. Accordingly, in the fall of that year he entered the University of Heidelberg, where he studied chiefly under Bunsen and Kirchhoff. While there he and T. H. Norton, working together, were the first to prepare metallic cerium, lanthanum and the mixture then called didymium. Their joint paper appeared in Poggendorff's Annalen in 1875, in which year Hillebrand attained his doctorate. For another year he remained at Heidelberg to continue his work on these metals. Until that time they had been considered as divalent and closely related to calcium. Dr. Hillebrand's determinations of their specific heats proved that they are trivalent, and therefore rare earth metals. It may be noted incidentally that he discovered the pyrophoric property of cerium filings. Many years later cerium-iron alloy came into commercial use for the tips of gas lighters.

The scholastic year 1876–77 was spent with Fittig at the University of Strassburg. Their joint paper on quinic acid represents his only serious divagation into the field of organic chemistry. One other paper written at Strassburg was on the crystal form of the ester of tetraacetylquinic acid.

The next winter, 1877–78, was spent at the Mining Academy at Freiberg. Although he published nothing from that institution, he there learned methods of assaying and no doubt received the impulse which started him along the path he ever afterwards followed.

Returning to America, Dr. Hillebrand worked for a time as an assayer in Leadville, Colorado, but soon seized the opportunity of an appointment on the staff of the United States Geological Survey. From 1880 to 1885 he was stationed at Denver, where there was no dearth of minerals to arouse his interest and upon which to exercise his growing skill as an analyst. While in Denver he wrote six papers, all on minerals and all but two in joint authorship with Whitman Cross. After his transfer to Washington this work continued. It did not cease when he became chief chemist of the Bureau of Standards in 1908, for he found time to work in the laboratory and to write several papers. In all he wrote about one hundred papers.

Once while chief chemist Dr. Hillebrand somewhat diffidently remarked that he had been appointed to the position because he had some reputation as an accurate analyst. That was his excuse for insisting that his subordinates should take the utmost pains in their work and not let themselves fall into careless ways. Dr. Hillebrand was too modest, because he will always stand as the first chemist who thought it worth while to make the most accurate possible analyses of rocks and minerals, to actually determine all their constituents, to have in the tabulation of his analyses no item large or small marked "undetermined," to report "traces" only when they were really such. The extra time devoted to his accurate and

detailed analyses was well spent, because the results revealed to geologists unexpected resemblances or differences in rocks. For instance he found that the igneous rocks of the Rocky Mountain region contain, on the average, much greater percentages of strontium and barium than the rocks in the eastern or the farther western parts of the country. If the reason for this fact is now unknown, some day it will throw a flood of light upon some geologic generalization.

Dr. Hillebrand's failure to identify helium in the gases that are evolved from uraninite by the action of hydrochloric acid was no doubt a bitter disappointment to him, though he dwelt upon it lightly. In 1890 he treated powdered uraninite in a test-tube with hydrochloric acid and observed the slow, continuous evolution of tiny bubbles, which he collected and analyzed. The gas was shown not to be carbon dioxide or hydrogen sulphide, and he succeeded in converting all but a small residue into ammonia. He felt justified in the belief that this residue was nitrogen that had not reacted. Years later his two papers on the occurrence of nitrogen in uraninite were called to the attention of Ramsay, who soon afterwards announced his discovery of helium.

Another matter from which Dr. Hillebrand received no benefit and little credit may be mentioned. In 1904 he called attention to the enormous quantities of potash that are volatilized and lost during the clinkering of Portland cement, and suggested that it should be collected and utilized. The recovery of this potash is now a commercial process.

Because he had no real forerunner in mineral and rock analysis, Dr. Hillebrand perforce had to devise general procedures suitable for the different types and special methods for the determination of individual elements. As his work became known through his published papers, there came a demand for some description of his methods. Perhaps he brought the demand upon himself with greater force by publishing in 1894 "a plea for greater completeness in chemical rock analysis." He met the demand in 1897 by writing a fifty-page section of Bulletin 148 of the Geological Survey. This was soon translated and published in Germany. It dealt only with the silicate rocks. Bulletin 176, of 114 pages, appeared in 1900. The carbonate rocks appeared in the title of Bulletin 305, in 1907, and thereafter. This bulletin was also translated into German. In 1910 appeared Bulletin 422, which was once revised. The series of bulletins, each an improvement upon its predecessors, culminated with the publication in 1919 of No. 700, a book of 285 pages. Papers on the determination of various elements appeared in the intervals between his bulletins. No chemist who consults any of these publications can fail to have impressed upon him the necessity of taking infinite pains at every step, if he is to make a really accurate analysis.

For a year prior to his death Dr. Hillebrand had devoted nearly all his time and energy to the preparation of a book on inorganic analysis. Ten years earlier he had been advised to write it, but had hesitated to undertake the task. It is fortunate that his notes for the projected book are so complete that his collaborator, G. E. F. Lundell, will be able to finish it.

In 1908 Dr. Hillebrand became the second chief chemist of the Bureau of Standards, in which position he remained until his death. In those early days of the bureau, which was just beginning to be well and favorably known throughout the country, he had only a handful of younger men under him. He was able to spend much time in the laboratory and wrote several papers on the composition of different minerals or on analytical methods. During this time he prepared his last two bulletins for the Geological Survey. As the bureau grew in size and importance the demands upon his time and energy increased, so that he entered the laboratory less and less frequently. He did not complain about this, but no doubt he many a time wished he were at his laboratory bench.

In 1908 the bureau had a modest list of standard analyzed samples: three of iron taken over from the American Foundrymen's Association, an argillaceous limestone, a zinc ore. These carefully prepared materials, the composition of which was known with the closest possible approach to exactness, were too near to his chosen field for him to neglect or ignore, particularly because they were intended to serve as standards for checking analytical methods. In the sixteen years that followed he took the greatest interest in the standard samples and did everything in his power to increase their number and usefulness, so that the bureau now distributes annually about five thousand samples representing sixty-five materials. He always jealously guarded the integrity of these samples and would not countenance including among their number any materials the composition of which was not known with an accuracy great enough to satisfy him.

He was a kindly chief, ready to discuss the problems and worries of his subordinates, not given to making the facile excuse that he was too busy to talk. He gave to every man his due of credit, he sought and obtained promotions in rank and salary for those who in his opinion were deserving. Always modest about his own attainments, he gave his associates full credit for whatever the chemistry division of the bureau accomplished. He took his administrative duties seriously and suffered undue worry lest

he should be found wanting. A man in his position must many times make decisions relating to the use of government funds and be tempted to divert them from their specifically authorized use to some other he may think more worthy. Dr. Hillebrand "leaned backward" in his uprightness and would not countenance any violation of the letter or the spirit of the law. His honesty in these matters was but a further expression of the integrity of purpose that was the great guiding principle of his life, the principle that made him perform a routine analysis with the greatest care, that made him give to any task the best that was in him.

A man of such character and attainments can not avoid membership in scientific societies or escape honorary recognition by the scientific world. Dr. Hillebrand was a fellow of the American Association for the Advancement of Science, a member of the American Chemical Society, of the American Society for Testing Materials, the Washington Academy of Sciences, the Geological Society of Washington and other societies. His election to membership in the American Philosophical Society and in the National Academy of Sciences must be regarded as honors. So, too, was the award of the Chandler Medal by Columbia University in 1916. His address on that occasion, "Our analytical chemistry and its future," is well worth reading by any chemist who may be disposed to regard analytical work as uninteresting and not worthy of a man's best efforts.

The American Chemical Society made great use of Dr. Hillebrand's ability and prestige as a chemist. For years he was an associate editor of the Journal, and with conscientious care read and criticized papers that were submitted to him for his opinion. His criticisms were constructive, and when adverse comment seemed called for he was tactful and considerate of the feelings of the authors. Later he acted in the same editorial capacity for the *Journal of Industrial and Engineering Chemistry*. During the first years of *Chemical Abstracts* his abstracts were sent in promptly and they were so carefully prepared as to need no editing.

He served on the society's committees, particularly those that had to do with analytical methods. Until the beginning of this year he was chairman of the Supervisory Committee on Standard Methods of Analysis. No division or section of the society may publish any analytical procedure as a standard without the formal approval of this committee. As its leader Dr. Hillebrand had now and then to bear the brunt of criticism that verged on harshness. He did not let this divert him from the stand he took when he was sure that he was right. On the other hand he was not obstinately dictatorial but would patiently listen to argument, willing to be convinced.

In 1906 he was president of the American Chemical Society. The address he delivered on retiring is one that is worth reading, especially with the thought in mind that he wrote it after a strenuous year of coping with internal dissensions that threatened to disrupt the society. Some of the members most concerned with industrial chemistry felt that their interests were being slighted in the journal, and there was danger that they would form an independent society. The prompt, energetic and tactful action of the leaders in the society, with Dr. Hillebrand at their head, averted this danger by the establishment of the *Journal of Industrial and Engineering Chemistry*.

With this inadequate and all too brief sketch of Dr. Hillebrand we close. We could not let him pass without a word, but no word can express how we feel about him. No trite and hackneyed phrases can make a stranger know him as he was, or brighten his memory for his friends.

> Praise from a friend, or censure from a foe,
> Are lost on hearers that our merits know.

C. E. WATERS

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SCIENTIFIC EVENTS

THE DRIFT OF THE "MAUD"[1]

THE following note is based upon wireless messages which have appeared during the last three years in the London *Times* reporting the progress of Amundsen's vessel, the *Maud*, in the Arctic. The object of the expedition was to drift in the ice across the North Polar Basin from the coast of Siberia. Amundsen made the northeast passage in 1918–20, but instead of beginning his drift at once, he was compelled to put into Nome, Alaska, in July, 1920. After various delays, the *Maud* finally sailed from Point Hope on July 26, 1922, but two days later Amundsen left the ship for Point Barrow, to make his unsuccessful attempt to fly to the Pole, and the voyage was continued under the command of Captain Wisting. Herald Island was sighted on August 7, and on August 22 the vessel was frozen in. In a wireless message her position on December 15 was given as lat. 73° 20′ N. and long. 173° W. (an error for 173° E.), and she began to drift slowly to the northwest, her position on March 10, 1923 being lat. 74° 2′ N., long. 170° 20′ E. In an undated report sent out towards the end of June it was given as 75° 25′ N., and 165° E. This

[1] From the *Geographical Journal*.