BIOGRAPHICAL MEMOIR

OF

HENRY BARKER HILL,

1849-1903.

BY

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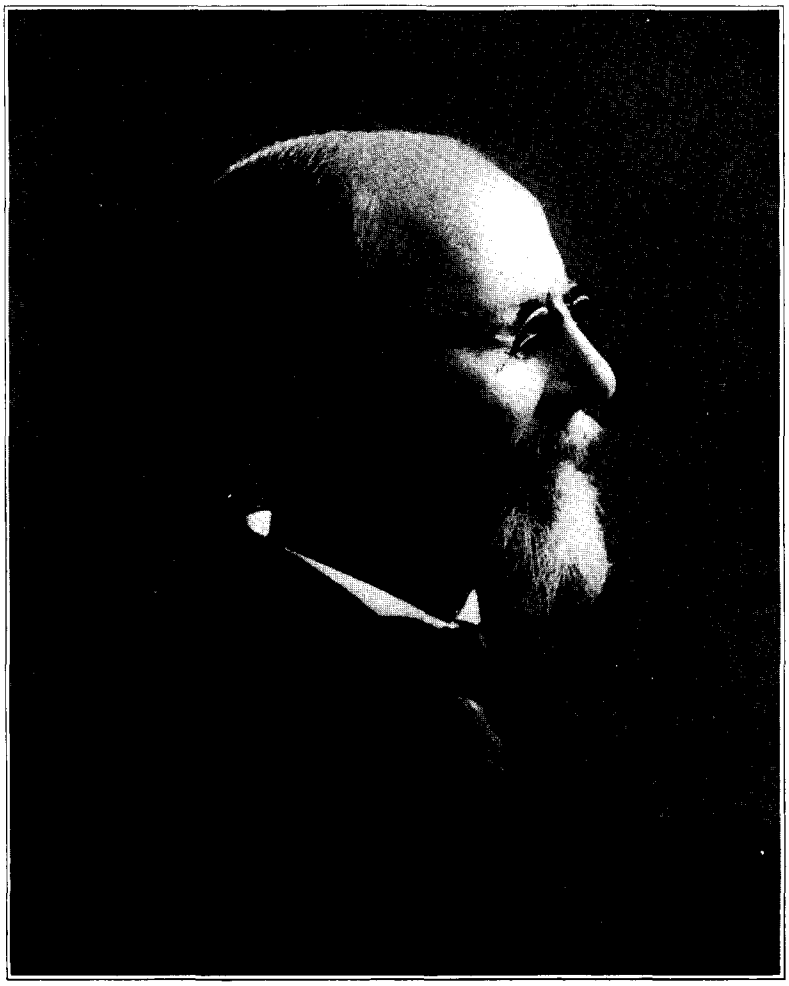

Charles D. Walcott

BIOGRAPHICAL MEMOIR OF HENRY BARKER HILL.

HENRY BARKER HILL was born on the 27th of April, 1849, at Waltham, Massachusetts, where his father, the Rev. Thomas Hill, was the clergyman of the Unitarian Church. His paternal grandfather came to this country from Warwickshire, in England, and settled in New Brunswick, New Jersey. His mother, whose maiden name was Anne Foster Bellows, belonged to a family long conspicuous in the history of New Hampshire and Vermont.

Dr. Thomas Hill was not only eminent in the Unitarian ministry and a man of broad and varied attainments in science and literature, but was also one of the most profound yet brilliant mathematicians in the country. The active, inquiring quality of his mind led him into many fields of research, and showed itself even in his amusements, as he delighted in puzzles and similar mental gymnastics. Young Hill, growing up under this singularly inspiring influence, was marked out by inheritance and environment for an investigator.

At ten years of age he went with his family to Yellow Springs, Ohio, where Dr. Hill succeeded Horace Mann as president of Antioch College, and was plunged into the academic atmosphere, which he was to breathe for the rest of his life.

In 1862, at the age of thirteen, he entered the freshman class of Antioch College, but left it before the year was out to accompany his father to Cambridge, whither he was called as president of Harvard University. Here he attended the Cambridge High School, and later passed through Harvard College, from which he graduated in 1869. The elective system was then in its infancy, and Hill devoted the few courses in which choice was allowed principally to chemistry, mathematics, and music. He was such an eminent scholar in each of these departments that many of his classmates were astonished when they heard at graduation that he had decided to be a chemist, as they had connected him rather with one of the other subjects. As a matter of fact, however, he had not only taken both of the elective

courses in chemistry, but had devoted much time in his senior year to an extra course on advanced crystallography.

The year after his graduation was spent in the Berlin laboratory under A. W. Hofmann in laying the foundations of a chemical education. Here he met his classmate, Mr. Edward L. Burlingame, who was living with his father, Anson Burlingame, then Chinese envoy at the Court of Prussia. The acquaintance between the two young men soon ripened into a close friendship, and this was of great importance to Hill, as it brought him into a cultivated diplomatic society presided over by Bancroft, the historian. Up to that time his retiring disposition had prevented him from associating with more than a few friends, and this wider range of associates had an excellent influence in the formation of his character.

When he went to Germany he had intended to stay for several years, in order to finish his chemical education, but at the end of the first year he was offered the position of Second Assistant in Chemistry in Harvard College. This offer was accompanied by a letter from his father advisiug him to accept the place, as he thought the chemical department of the college was on the eve of a marked growth. Hill cut short his scientific education and returned to Cambridge with many misgivings, but his subsequent career proved the wisdom of this step.

His chemical training at this time was slender. In Harvard College he had taken one course in qualitative analysis, one in mineralogy, and the advanced crystallography already mentioned. In Berlin he had devoted one semester to quantitative analysis, the second to organic chemistry, and had heard the lectures on inorganic and organic chemistry. He came home full of enthusiasm for original work, and determined to do his share toward the advancement of the science, but with neither teaching nor experience in research.

His duties at first consisted in teaching theoretical chemistry and qualitative analysis, to which, in 1874, he added a course in organic chemistry; and these two latter subjects, with the addition of quantitative analysis for a few years, made up the bulk of his teaching work during the rest of his life. In 1891 he served as lecturer on organic chemistry for a year at the Massachusetts Institute of Technology.

In his teaching he was not content to follow slavishly the ideas

of others, or to drop into a routine; thus working out the principles established by Professor Cooke, he converted qualitative analysis from a purely mechanical affair into one of the best of educational disciplines. A small book embodying his ideas on this subject—Lecture Notes on Qualitative Analysis—is his only published volume.

His course in organic chemistry was a model of comprehensiveness, and of the preservation of the just relation between the important and the unimportant. It was kept abreast of the times—no light task in a science growing so rapidly—and in many instances was even in advance of them, as his penetrating judgment often led him to conclusions only accepted by the chemical world long afterward—one notable example of this is his anticipation by many years of the present theory of the constitution of the diazo compounds. His early mathematical training also showed itself in his calculation of the number of isomeres possible for various formulas—a subject treated with great fullness and vividness in his lectures.

In 1871 he married Miss Ellen Grace Shepard, of Dorchester, who survives him. Their son, Edward Burlingame Hill, inherited one of his father's marked tastes, and is a successful musician. Hill was an affectionate and devoted husband and father, and his chief happiness lay in his domestic life.

As his salary from the college was for a long time far below his moderate wants, he turned his attention during these early years to applied chemistry, and made a short investigation of the amount of carbonic dioxide in the air and an exhaustive study of the adulterations in confectionery sold in Massachusetts. Both of these were made for the State Board of Health and described in its reports. He also did some chemical work for a bleachery, and later was for many years the consulting chemist of Carter and Company, the manufacturers of ink. In this commercial work Hill for the first time showed his high quality as a chemist, for the overflowing enthusiasm for research with which he came home from Germany had met with many obstacles; his training, as has been said, was meager, and there was no organic chemist at Cambridge to help him finish his education, his laboratory accommodations at first were inadequate, consisting of a corner in the large public laboratory, until in 1875 he shared a small private laboratory with the present

writer, and, worst of all, his time and energy were taken up by his duties as a teacher and by his commercial work. But he was not the man to be turned aside from his purpose even by such difficulties, and not a year passed in which he did not make progress, either by the necessary preliminary studies or by vigorous attacks on some field of research. At first these efforts led to no results, but with the patience and perseverance which were among his most marked characteristics he considered these defeats part of the training necessary for success, and at last, in 1876, he attained it in the publication of his first scientific paper, which was remarkable in showing none of the crudeness and uncertainty of touch usually characteristic of first papers, but was a well selected research, treated with the vigor, scientific insight, and beauty of finish of a mature chemist. This paper was on the methyl ethers of uric acid, and by following the fate of the methyl in the decomposition products he succeeded in throwing much light on the structure of this perplexing substance. This method of attack, originated by him, has lately, in the hands of Professor Emil Fischer, led to the determination of the constitution of uric acid.

The work for the ink factory already mentioned now had, indirectly, a commanding influence on his scientific career, as, in behalf of this firm, he visited the pharmaceutical factory of Dr. Squibb in Brooklyn to see some improved forms of percolators. During this visit Dr. Squibb showed him a new process for making acetic acid by the distillation of oak wood at temperatures from 150° to 200°, and asked him if he wished to examine the waste products. On his joyful acceptance of the offer a large amount of material was sent him, in which he discovered furfurol, at that time an almost unstudied substance, since its price, according to the catalogues, was $80 a kilogram.

While Hill was making preparations to use this happy chance to the utmost, a paper reached him in which Professor von Baeyer reserved the whole field for his own work; but when he heard of Hill's unrivaled opportunity he most generously resigned to him the investigation of mucobromic and mucochloric acids, and later, after the publication of a few papers, retired from the field, leaving it to Hill.

The work on uric acid, in spite of its interest and promise, was now dropped, after the publication of two papers, and the

investigation of the derivatives of furfurol taken up, which occupied Hill's attention to the end of his life. His work in this field remains an enduring monument to his memory, for he converted the furfurane compounds from an unexplored waste into one of the best known of the larger domains of chemistry.

This work was described in over thirty papers, and among his most striking achievements may be noted the full study of mucobromic and mucochloric acids, with the determination of their puzzling constitution and the investigation of numerous substituted propionic, acrylic, and propiolic acids derived from them; the description of the brom- and chlorpyromucic acids, in which the interesting fact was brought out that these two halogens differ in their behavior with pyromucic acid; the study of the nitro and sulphonic derivatives of the furfurane compounds, with a careful comparison of the substances belonging to this group, with the corresponding aromatic bodies; the discovery of nitromalonic aldehyde and a long line of brilliant aromatic syntheses from it; a study of methylfurfurol, found in the fractions boiling above furfurol, and of its most important derivatives.

Many years later the manufacture of acetic acid by this process was abandoned, and furfurol once more became a rare substance; but as this misfortune seemed about to paralyze his work, he contrived an improvement in the manufacture of dehydromucic acid (a derivative of furfurane), which made this substance very accessible and gave him fresh material for the study of this group. This was no lucky chance like the discovery of furfurol, but the intentional improvement of an old process worked out with great sagacity.

At the time of his death he was investigating pyrazol compounds from the oxime of nitromalonic aldehyde, and the reduction products of dehydromucic acid, some of which he had succeeded in separating into the optically active forms.

An examination of these papers brings out Hill's great qualities as a chemist—his grasp of the subject and power of close and logical reasoning, his uncommon experimental ability, and above all the thoroughness and accuracy which were his most striking and peculiar characteristics. Most chemists are content to accept the work of their students after testing it in two or three

places, but he was never willing to publish until he had repeated the whole of it with his own hands, and if this diminished the number of his papers, it gave them a finish and authority rarely found in those of others. His papers, too, are written in a clear, finished, and beautiful style, unfortunately not too common in purely scientific articles.

From his students in research he exacted the same thoroughness and accuracy he used in his own work, and while this overtaxed the patience of a few, most of them became filled with his spirit, and all felt toward him an enthusiastic admiration and affection.

In 1874 he was made assistant professor, in 1884 full professor, and in 1894, on the death of Professor J. P. Cooke, he was appointed Director of the Chemical Laboratory. He was then confronted with the problem of forcing the rapidly growing department into an antiquated building, originally planned for forty students, with walls, both inside and out, of hampering massiveness. Under these discouraging conditions he contrived adequate laboratories for seven hundred students, enriched with new forms of hoods, water baths, and other apparatus, which revolutionized the methods of chemical architecture.

He was equally efficient in the organization of the business affairs of the department, so that this large establishment was managed with a minimum of work, and yet with perfect accuracy in every detail. It was no vain praise when he was called by the best authority the ideal director. These extraordinary results were not obtained without grave sacrifices on his part. For three years he could give but little attention to his original work, and even after the department was reorganized he insisted with characteristic thoroughness on attending to a multitude of details, which took up time that could be ill spared from research.

The ingenuity and mechanical skill shown in contriving the hoods and water baths in the public rooms also appeared in many new devices for the furtherance of his researches and placed carpentry and cabinet-making among his favorite amusements.

He was elected into the National Academy of Sciences in 1883, and was also a member of the American Academy of Arts

and Sciences, the New York Academy of Sciences, the Washington Academy, and the German and American Chemical Societies. He had little time and less taste for the meetings of learned societies, or the faculty of the college, and was particularly averse to taking part in public discussion from an entirely unwarranted distrust of his ability as a debater, but in committee work his administrative power and sound judgment were of great use to the university, especially in the practical reorganization of the Lawrence Scientific School. At the time of his death he was a member of the Standing Committee of the Parish of the First Church of Boston.

With all this devotion to his profession he was no narrow specialist; his reading was wide and judicious in more than one language; he was a genealogist and musician of no mean attainments, and he possessed a truly astounding wealth of information on the most varied subjects. His disposition was naturally retiring, and these various employments left him little leisure for society; in fact, in Cambridge his life was almost that of a recluse, but the narrowing tendency of such a life was entirely counteracted by the pleasant social intercourse of his summers, passed during the last part of his life in Dublin, New Hampshire, where he showed himself such a charming companion that the necessity of his retired life during term time was the more regretted.

He never spared himself in anything, even in his recreations, maintaining that he preferred to wear out rather than to rust out; his health, therefore, was far from good, the days when he was free from headache and dizziness being the exception rather than the rule, but he never gave up. Frequently he has lectured when most other men would have been in bed. These uncomfortable attacks seemed, however, rather unpleasant than dangerous, and even after more serious symptoms had appeared his friends hardly realized their import; so that it came as a surprise to most when, on April 1, 1903, he was seized with a violent malady, sank rapidly, and died on April 6.

He was known to the world by his work; but his friends delight to dwell on his patience, unselfishness, and modesty; his warm, affectionate nature; the fortitude which never allowed bodily weakness to interfere with his duties; the poise and sanity of his

judgment, and, above all, on the entire sincerity, the aggressive honesty, which were the expression of the ruling principle of his life—an almost passionate devotion to truth.

A LIST OF THE PRINCIPAL CHEMICAL PAPERS BY HENRY BARKER HILL.

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2. On the Ethers of Uric Acid. (Second Paper.) Dimethyluric Acid. With C. F. Mabery. Proc. Amer. Acad., **15**, 256. Amer. Chem. Journ., **2**, 305.
3. Furfurol One of the Products of the Dry Distillation of Wood. Proc. Amer. Acad., **16**, 156. Amer. Chem. Journ., **3**, 33.
4. Pyroxanthin. Proc. Amer. Acad., **16**, 161. Amer. Chem. Journ., **3**, 332.
5. Mucobromic Acid. Proc. Amer. Acad., **16**, 168.
6. Mucochloric Acid. Proc. Amer. Acad., **16**, 204.
7. Substituted Acrylic Acids from Brompropiolic Acid. Proc. Amer. Acad., **16**, 211.
8. *Theoretical Considerations.* Proc. Amer. Acad., **16**, 218.
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10. On the Relation between Dibromacrylic Acid and Tribrompropionic Acids. With C. W. Andrews. Proc. Amer. Acad., **17**, 133. Amer. Chem. Journ., **4**, 176.
11. On Certain Tetrasubstituted Propionic Acids. With C. F. Mabery. Proc. Amer. Acad., **17**, 140. Amer. Chem. Journ., **4**, 263.
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13. On Mucophenoxybromic Acid. With E. K. Stevens. Proc. Amer. Acad., **19**, 262. Amer. Chem. Journ., **6**, 187.
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19. On Chlorpyromucic Acids. With L. L. Jackson. Proc. Amer. Acad., **24**, 320 Amer. Chem. Journ., **12**, 22, 112.
20. On Certain Derivatives of Furfuracrylic Acid. With H. B. Gibson and C. F. Kahnweiler. Proc. Amer. Acad., **24**, 364. Amer. Chem. Journ., **12**, 314.
21. On the So-called Dioxymaleic Acid. With W. S. Hendrixson. Proc. Amer. Acad., **24**, 376. Amer. Chem. Journ., **12**, 325.
22. On Chlorsulphopyromucic Acids. With W. S. Hendrixson. Proc. Amer. Acad., **25**, 283. Amer. Chem. Journ., **15**, 145.
23. On Certain Products of the Dry Distillation of Wood. Methylfurfurol and Methylpyromucic Acid. With W. L. Jennings. Proc. Amer. Acad., **27**, 186. Amer. Chem. Journ., **15**, 159.
24. On Certain Derivatives of Pyromucamide. With C. E. Saunders. Proc. Amer. Acad., **27**, 214. Amer. Chem. Journ., **15**, 130.
25. On Certain Substituted Crotonolactones and Mucobromic Acid. With R. W. Cornelison. Proc. Amer. Acad., **29**, 1. Amer. Chem. Journ., **16**, 188, 277.
26. On Mucophenoxychloric Acid. With H. E. Sawyer. Proc. Amer. Acad., **30**, 242.
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29. On Certain Derivatives of Brommaleic and Chlormaleic Acid-aldehydes. With E. T. Allen. Amer. Chem. Journ., **19**, 650.
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31. On the Conversion of Methylpyromucic Acid into Aldehydopyromucic and Dehydromucic Acids. With H. E. Sawyer. Amer. Chem. Journ., **20**, 169.
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33. On Nitromalonic Aldehyde. With J. Torrey, Jr. Amer. Chem. Journ., **22**, 89.
34. Notiz über 2, 6 Diphenyl-4-nitrophenol und 2-Phenyl-4-nitrophenol. Ber. Deutsch. Chem. Ges., **33**, 1241.
35. On Nitromalonic Aldehyde. (Second Paper.) On the Condensation of Nitromalonic Aldehyde with Certain Ketones and Ketone Acids. With C. A. Soch and G. Oenslager. Amer. Chem. Journ, **24**, 1.
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41. On Formiminoethylether. With O. F. Black.
42. On Nitrolactic Acid. With O. F. Black.
43. On the Optically Active Isomeres of β-Dihydrofurfurane-α-α-dicarboxylic Acid. With F. W. Russe.
44. On Tribrompyrazol. With O. F. Black.
45. A new Apparatus for the Determination of Melting Points.
46. Some Sulphamido Derivatives of Furfuran. With J. P. Sylvester.