# MEMOIR

OF

# GEORGE HAMMELL COOK.

## 1818-1889.

BY

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# BIOGRAPHICAL MEMOIR OF GEORGE HAMMELL COOK.

GEORGE HAMMELL COOK was born at Hanover, New Jersey, on the 5th of January, 1818. He died in New Brunswick, New Jersey, September 22, 1889.

His ancestors on the male side came from England to Massachusetts in 1640, but for several generations have lived in New Jersey. He was the third son of John Cook and his wife Sarah Munn.*

His schooling was in the country school of his native town and in the Rensselaer Polytechnic Institute at Troy, New York, where he graduated at the age of 21. As a boy he assisted on two surveys for railways, and the degree he received at Troy was that of civil engineer. This early bent toward engineering was modified at Troy by association with Amos Eaton, from whom he acquired that interest in geology and other departments of natural history which determined his future career. After graduation he was employed in the Institute as tutor, then as adjunct professor, and finally as senior professor.

In 1846 he was married to Mary Halsey Thomas, who survives him. From 1846 to 1848 he engaged in business in Albany.

* This statement is taken verbatim from a memoir of Professor Cook by James Neilson. Marks of quotation are omitted because consistency would demand their use with a very large number of parts of sentences. Writing seven years after Professor Cook's death, I find this historical part of my subject already compiled in nearly a dozen biographies and biographic notices, and these have been drawn on with the utmost freedom. I am especially indebted to the following:

Addresses commemorative of George Hammell Cook, Ph. D., LL. D., Professor of Geology and Agriculture in Rutgers College, delivered before the Trustees, Faculty, Students, and Friends of the College, June 17, 1890, Newark, 1891. [These addresses are by James Neilson, Abram S. Hewitt, J. W. Powell, J. B. Drury, and T. S. Doolittle. The same volume contains letters by James D. Dana and R. W. Raymond.]

George H. Cook, late State Geologist of New Jersey, by John C. Smock, *American Geologist*, December, 1889.

Obituary, George H. Cook, *Amer. Jour. Sci.*, vol. 38, 1889, pp. 498–499.

He then joined the teaching force of the Albany Academy, and was its principal from 1851 to 1853. In 1852 he was sent to Europe by the State of New York to study salt manufacture in the interest of the salt industry of Onondaga county; and the earliest of his scientific writings which I have discovered are reports to the State on methods of brine reduction and their chemistry. In 1853 he returned to his native State, being called to the chair of chemistry and natural sciences in Rutgers College, at New Brunswick. This chair he retained, under various titles, until his death, 36 years later, and it was during this period that the great work of his life was accomplished.

Properly to characterize Cook's scientific work it is necessary to recognize certain distinctions. Scientific research, or the seeking and discovery of the laws of nature, is sometimes carried on for its own sake or without reference to a definite ulterior end, and is then called *pure science*. The knowledge acquired through research is the foundation of human progress, but is thus utilized only through the discovery of methods of application, and the discovery of such methods constitutes *applied science*. These two are complementary, but they do not include all the work of science. There is also research which is prosecuted for the sake of, and with constant reference to, definite utilitarian ends, so that the discovery and the application of natural laws are parts of one process. This may be called *practical science*. The love of pure science is the blind instinct of civilization. It delights to lay eggs—the more, the better—but gives no thought nor care to their hatching. Applied science is a working bee who builds cells of utility, and in them rears to maturity the larvæ hatched from her sister's eggs. Practical science may rather be compared to intelligent parentage, which not only conceives and bears, but nourishes and rears its progeny, foreseeing the end from the beginning. Cook contributed little to pure science. He gave more to applied science. He devoted his life to practical science. A study of his work shows that every research was for a practical end, and that end was steadily kept in view. His methods of investigation were those of pure science, but he never suffered himself to be diverted from his chosen path to the search for natural knowledge which promised no immediate nor early tribute to the material needs of man.

The field of his labor was the State of New Jersey, and those who reaped the benefit were the citizens of New Jersey. His success was great. The talent and energy he brought to his work might have achieved world-wide fame in the domain of pure science. In the domain of applied science they would have given him great wealth. Used as they were, they brought him the sincerest appreciation, respect, and gratitude of the community for which he toiled.

The three subjects which most occupied him were geology, agriculture, and water supply, and, though their lines of research ran side by side and were partly interwoven, it is convenient to describe them separately.

In 1854, a year after Cook's return to New Jersey, a State geological survey was organized with Dr. William Kitchell at its head. Cook was his associate, with the title of assistant State geologist, and was actively engaged in the work until 1856, when the survey was suspended. In 1864 it was revived, and the legislative act providing for its maintenance named Cook as State geologist. This personal designation was repeated in subsequent acts, and he held the office continuously for a quarter of a century—until his death. The work of geologic surveying pursued the usual course, beginning with reconnoissance, following with the discrimination and mapping of formations in an approximate way, and afterward refining the classification, maps, and measurements; but the refinement was practically restricted to such details as were needed for the best understanding of recognized economic materials. The relations of the iron and zinc ores to the structure of the surrounding rocks were worked out. The sources of building stones, flagging, paving blocks, and other structural materials were described. The clays available for building brick, fire-brick, pottery, and porcelain were elaborately studied, and the reports on them gave powerful impetus to industries that have now reached great magnitude. Much attention was given to greensand and other mineral fertilizers; their extent was determined and the farming community was made acquainted with their existence and value. From all this work, involving a literary output of several thousand pages, but two results in pure science were deemed of such general interest as to demand publication outside the State. One was the determination of the southern boundary of the glacial

drift, a pioneer contribution to the mapping of the chief terminal moraine; the other the demonstration and measurement of the secular sinking of the New Jersey coastal plain.

For the needs of the geologists, a topographic map had been begun under the direction of Dr. Kitchell, and this work was continued by his successor. Foreseeing the multifarious uses and great value of good maps, he established a high standard of excellence, and his State is today almost without a rival in the quality of its topographic delineation.

From the study of soils and mineral fertilizers to the study of broader agricultural questions was an easy step, and Cook soon became as deeply interested in problems of tillage as in mineral resources. It was largely through his influence that the administration of the land grant from the United States to the State of New Jersey for the promotion of agriculture and the mechanic arts was given to Rutgers College, and when the resulting scientific school was organized he was placed in charge of its agricultural branch. This was in 1864, and almost immediately he secured the purchase of a tract of 100 acres, which was called the "Experimental farm," and on which he instituted a series of experiments on the comparative value of various fertilizers and on kindred problems. Here, again, he was a pioneer, for it was not until eleven years later, 1875, that the Connecticut agricultural experiment station was founded. In 1870 he visited Europe for the purpose of studying the experimental work there in progress, and another tour of the European stations was made in 1878, while he was a delegate to the geological congress in Paris. He then undertook to enlarge the scope of his experimental work by securing State aid, and in 1880 succeeded. An agricultural experiment station was established and he became director. He was prominent also in the agitation which led to the passage by Congress in 1887 of the so-called Hatch bill, creating a national system of stations. His directorship of the State work continued for nine years—until his death.

In 1871 the New Jersey State Board of Agriculture was instituted, and Cook was so largely instrumental in procuring the necessary legislation that he is known as the founder of the board. During the remainder of his life he was a member of the board and its executive committee.

It is not necessary to recite the various researches he conducted

or directed in and through these various organizations. Suffice it to say that he used scientific method for practical results; that he enlisted farmers' clubs and farmers in experimentation; that he made many annual tours among them, giving one or more lectures in each county, and that his results were published as rapidly as reached and widely utilized. In an age of general progress it is impossible to discriminate the product of one man's effort, but there can be no exaggeration in saying that the phenomenal development of the agriculture of his State was due to him more than to any other individual.

During the progress of the geological survey the subject of municipal water supply demanded public attention, and one of the important results of the topographic work was the delineation of the catchment basins, with their areas and altitudes. To this were added a preliminary study of forests as conservators of water, and eventually a system of rainfall records. As early as 1857 Cook began regular observations of temperature and rainfall at New Brunswick, and these were continued until his death, much of the actual work being done by him personally. At his suggestion volunteer observers started similar series of observations in various parts of the State, and in 1886 a State weather service was established under his direction. The publications of this organization consist merely of monthly records of local weather, a dry tabulation of facts, but I am informed by the Chief of the United States Weather Bureau that "some of the most valuable suggestions for the prosecution of State weather service work were made by Professor Cook, and the ideas originating with him have been largely followed in organization in other States."

In the investigation of surface waters Cook's function was largely that of an organizer, and the results belong chiefly to the future, but the search for artesian water, instituted by his advice and conducted to a large extent under his guidance, had before his death yielded the most gratifying returns. Through a long line of seaboard towns the contaminated and dangerous waters of surface wells have been replaced by pure waters drawn from deep-lying sands, and all the towns of the coastal plain are profiting by the new knowledge.

Cook had a strong constitution and what has been called a "genius for work." His labors were carried far into the night

and resumed early in the morning, and much of his remarkable accomplishment must be credited to his untiring industry. Despite his multifarious responsibilities, he was at home to every visitor, and responded with unfailing patience to all calls for information. Through this freedom of intercourse he kept himself in touch with the people of the State, who were thus enabled to appreciate his earnestness and unselfishness, and this practice had much to do with the general confidence in him and his work which secured from successive legislatures votes that were nearly unanimous for the continuance of his appropriations. The same free intercourse was also used in a direct way for the futherance of his researches, for he was alert to the possibilities of knowledge from all sources, and found in his interviews with farmers, manufacturers, and miners valued opportunities for adding to his own store of information.

His devotion to practical science, viewed from another side, was devotion to the interests of his State, and this devotion, combined with his simplicity of character, was the foundation of that public confidence which gave success to his advocacy of new measures and placed him in so many positions of responsibility and trust. The unselfishness of his devotion was illustrated not only by his refusal to abandon the public work for private work with great pecuniary advantage, but by his unwillingness to have an office created at his own request become to him a source of emolument. When he was appointed Director of the Agricultural Experiment Station he insisted that the amount of the salary attached to that position should be deducted from his salary as State Geologist.

From the University of New York he received the degree of Doctor of Philosophy; from Union College, Doctor of Laws. He was vice-president of the American Association for the Advancement of Science in 1888, presiding over Section E at the Cleveland meeting. He was elected to membership in this Academy in 1887. His noblest decoration was the gratitude and love of those among whom and for whom he labored—the people of his State.

His writings consist largely of official reports. His work on the geology and geography of New Jersey is published in thirty annual reports, covering the years 1854–1856 and 1863–1887; in the *Geology of New Jersey*, 1872; in the *Report on the Clay De-*

*posits of Woodbridge, South Amboy, and other places in New Jersey*, 1878; in a *Report on a Survey of the Boundary Line between New Jersey and New York, made in July and August, 1874;* in volume I of *The Paleozoic, Cretaceous, and Tertiary formations of New Jersey*, 1886, and in volume I of the *Final Report of the State Geologist*, 1888. His official papers on agriculture are contained in the annual reports of the State College of Agriculture and Mechanic Arts (afterward Rutgers Scientific School) from 1865 to 1888, and the annual reports of the State Agricultural Experiment Station from 1880 to 1888. His official contributions to climatology began in the reports of the Rutgers Scientific School and included monthly bulletins of the State Weather Service from 1886 to 1889.

The following list of unofficial or scattered papers is based in large part on the bibliography of his geological writings by John C. Smock, contained in volume 5 of the Bulletin of the Geological Society of America:

Experiments and Observations made upon the Onondaga Brines: *Annual Reports of the Superintendent of the Onondaga Salt Springs of New York*, 1850, 1851; 1853, January; 1853, December, and 1861.

On the Subsidence of the Land on the Seacoast of New Jersey and Long Island: *Am. Jour. Sci.*, vol. xxiv, 1857, pp. 341-354; also *Can. Nat.*, vol. 2, 1857, pp. 258–261.

On the Probable Age of the White Limestone at Sussex and Franklin Zinc Mines, New Jersey: *Am. Jour. Sci.*, vol. xxxii, 1861, pp. 208, 209.

Soils of New Jersey and their Distribution. Fertilizers. Improved and Unimproved Lands in New Jersey: *First Ann. Rep. New Jersey State Board of Agriculture*, 1874, pp. 11–54.

Report on Fertilizers and on the College Farm: *Second Ann. Rep. New Jersey State Board of Agriculture*, 1874, pp. 5–34.

Soils and their Composition. Lime. Greensand Marl: *Third Ann. Rep. New Jersey State Board of Agriculture*, 1875, pp. 27–59.

Marls: *Ibid.*, 1877, pp. 45–138.

The Southern Limit of the Last Glacial Drift across New Jersey and the Adjacent Parts of New York and Pennsylvania: *Trans. Am. Inst. Min. Eng.*, vol. vi, May, 1877, pp. 467–470.

Catalogue of the Geological Survey Exhibit of New Jersey: *Rep. New Jersey Com. Cent. Ex.*, 1877, pp. 217–304.

Shell or Calcareous Marls: *Fourth Ann. Rep. New Jersey State Board of Agriculture*, 1877, pp. 16–54.

Report on the College Farm, 1877–1878: *Sixth Ann. Rep. New Jersey State Board of Agriculture*, 1879, pp. 13–26.

Agriculture in Europe—Report on Agriculture and Agricultural Teaching in Europe: *Ibid.*, pp. 27–108.

The Change of Relative Level of the Ocean and the Upland on the Eastern Coast of North America: *Proc. Am. Asso. Adv. Sci.*, 1882, pp. 400–408.

Report of the New Jersey Commissioners concerning the Northern Boundary Line between the States of New York and New Jersey, 1883, pp. 3–19. [This report is signed by George H. Cook and five other commissioners.]

[With John C. Smock] New York [Building Stones]: *Tenth Census of the United States, Report on Building Stones, etc.*, 1884, pp. 129–139.

[With John C. Smock] New Jersey [Building Stones]: *Ibid.*, pp. 139–146.

Explanatory statements, with maps [on the Location and Boundaries of East New Jersey]: *Bicentennial of the Board of American Proprietors of East New Jersey*, 1885, pp. 45–55.

Address on the Agricultural College: *Twelfth Ann. Rep. New Jersey State Board of Agriculture*, 1885, pp. 71–73.

The Protection of our Forests from Fires: *Fifteenth Ann. Rep. New Jersey State Board of Agriculture*, 1888, pp. 289–313.

On the State Weather Service: *Ibid.*, pp. 280–283.

Report of Subcommittee on Mesozoic: *Congrés Géol. Int., 4th session, London*, 1888, pp. 161–165.

On the International Geologic Congress and our part in it as American Geologists: *Proc. Am. Asso. Adv. Sci.*, vol. 37, 1889, pp. 159–177.