Geo. H. Cook
Nov. 5. 1887

ARTOTYPE, E. BIERSTADT, N. Y.

ADDRESSES

COMMEMORATIVE OF

GEORGE HAMMELL COOK, Ph.D., LL.D.,

PROFESSOR OF

Geology and Agriculture in Rutgers College,

By

James Neilson, et al.,

DELIVERED BEFORE THE

TRUSTEES, FACULTY, ALUMNI, STUDENTS AND FRIENDS OF THE COLLEGE,

JUNE 17, 1890.

TOGETHER WITH

A BIOGRAPHICAL SKETCH READ BY REQUEST BEFORE THE NEW JERSEY HISTORICAL SOCIETY AT TRENTON, JANUARY 28, 1890.

NEWARK, N. J.
ADVERTISER PRINTING HOUSE,
1891.

GEORGE H. COOK.

STATE GEOLOGIST OF NEW JERSEY—DIRECTOR OF THE AGRICULTURAL EXPERIMENT STATION OF NEW JERSEY—PROFESSOR OF GEOLOGY AND AGRICULTURE IN RUTGERS COLLEGE.

BY JAMES NEILSON.

GEORGE H. COOK, PH.D., LL.D., State Geologist of New Jersey, Director of the Agricultural Experiment Station of the State, Vice-President of Rutgers College and its Professor of Geology and Agriculture, died at his residence in New Brunswick, New Jersey, Sunday, September 22d, 1889. He died as he had lived, and as he wished to die, in the active discharge of his duties.

George Hammell Cook was born at Hanover, Morris County, New Jersey, on January the 5th, 1818. He was the third son of John Cook and his wife Sarah Munn. His ancestors on the male side came from England in 1640 to Lynn, Massachusetts. They soon after removed to Southampton, Long Island, and thence to Hanover, New Jersey, where their house, the home of several generations, still stands. It was built one hundred and seventy-five years ago, and is still owned by Doctor Cook's brother. An old record of a will dated 1751, states that John Williams gives it to his daughter, Mary Cook, wife of Ellis Cook.

Lieutenant-Colonel Ellis Cook, of Hanover, Morris

County, son of the last named [born 1732 and died 1797], and the great-grandfather of the subject of this sketch, was one of the prominent men of the State during and after the Revolution. He was a member of the Committee of Correspondence, and afterward of the Legislature, where he was one of the active men, always a member of the great committees. He was appointed Lieutenant-Colonel of the Morris Militia, and was a member of the Provincial Congress of 1776, which organized the State by its constitution. Where important work was to be done, there, like his distinguished great-grandson, we find him quietly doing it.

Doctor Cook was married on March 26th, 1846, to Mary Halsey Thomas. Mrs. Cook, two sons and two daughters survive.

As a boy Doctor Cook attended the country school of his native town. In 1836 he served on the survey for the Morris and Essex Railroad, and then on that of the Catskill and Canajoharie road. In December, 1838, he entered the Rensselaer Polytechnic Institute at Troy, New York, and graduated thence with the degree of C. E. in 1839. He there acquired, under the inspiration of the famous teacher, Amos Eaton, that love for the natural sciences which distinguished him, and which has borne fruit to the great advantage of his native State and of a wide circle of friends and pupils—a notable instance of the power and far-reaching influence of the enthusiastic and magnetic teacher. After graduation, Doctor Cook was employed as a tutor, then as adjunct professor, and from 1842 to 1846 as senior professor in the Institute.

In 1846 he removed to Albany, where for two years he was engaged in business, and from 1848 to 1851 was Professor of Mathematics and Natural Philosophy in the Albany Academy, and from 1851 to 1853 he was Principal of the Academy. In 1852 he was sent to Europe by the

State of New York, to study the salt deposits for the benefit of those of Onondaga County.

In 1853 he was called to the Chair of Chemistry and Natural Sciences in Rutgers College, at New Brunswick, and retained his connection with the College during his life. He had already received the degree of Doctor of Philosophy from the University of New York, and in 1865 Union College conferred upon him that of Doctor of Laws.

In 1854 he was appointed Assistant Geologist of the State of New Jersey, and was in charge of the southern division of the State for three years. At this time he made reports on the green-sand marl beds, the clay beds and on the coast changes. The fact of the subsidence of the coast, and the stratigraphical relations of the marl beds were discovered by him at this early day. The geological survey was suspended from 1856 till 1863, when the Legislature put the property of the survey in his charge, and in 1864 he was made State Geologist by act of the Legislature, which by nearly unanimous votes in 1872, 1876, 1880 and 1885 continued the survey with Doctor Cook at its head.

In 1864 Doctor Cook used his influence successfully to connect the "State College for the Promotion of Agriculture and Mechanic Arts" with Rutgers College, and he was made Vice-President of the combined institution. In 1873 he lent his aid in the formation of the State Board of Agriculture, and was ever after a member of its Executive Committee.

In 1877, at the Wilkesbarre Meeting of the American Institute of Mining Engineers he read a paper on "The Southern Limit of the Last Glacial Drift across New Jersey and the Adjacent Parts of New York and Pennsylvania." He was one of the first to discover the existence of a great terminal moraine in the eastern United

States; a description of which appears in the reports of the survey for 1877 and 1878.

The geological survey under Doctor Cook's management has been the medium through which the closest scientific research has been applied to the practical needs of the State. The knowledge thus communicated has led to the development of the clays, of the iron and zinc, the soils, the swamp lands, water supply, and many other interests. One of the most important achievements of the survey has been the beautiful series of twenty maps on the scale of one mile to an inch, topographical, geological and hypsometric, executed with the last degree of accuracy and care, and just completed before Doctor Cook's death. They are said by competent judges to be the best published by the different States. They have been adopted by the United States geological survey, and indeed, are considered the best which exist.

Doctor Cook's interest in popular education was untiring; his efforts in that direction extended throughout his life, and were wise and comprehensive. He was early impressed with the great importance of agricultural experiment stations, and examined carefully into their organization and working, visiting the more prominent stations in Germany, France, Italy, Sweden, Norway and England in 1870, and again in 1878, while in Europe as a delegate to the Congress of Geologists at the Paris Exhibition.

During the session of 1879 he brought the subject before the New Jersey Legislature, and with his usual perseverance again in 1880, when, owing to the confidence of the State Government in him, the Station of New Jersey was established. He was appointed its Director, and under his wise management it has obtained the confidence of the farmers in a remarkable degree; it has been of the greatest possible service to the agricultural inter-

ests of the State, and its bulletins have been sought throughout the country.

While attending the recent annual convention of experiment stations and agricultural colleges at Washington, the delegation from the New Jersey Stations were greatly impressed with the remarkable foresight shown by Doctor Cook in the many lines of work and policy not adopted elsewhere, which were there considered, in the light of events, wise for the future, but which *he* had already inaugurated in the college and Station here, in numerous instances, since many years. Although the stations of Connecticut and North Carolina were established a short time before the one in New Jersey (the first in 1875, the second in 1877, and the last in 1880), Doctor Cook already in 1870 had thoroughly investigated the subject in Europe and had planned the work to be done. The passage by Congress of the Act of 1887, creating the system of stations in every State, was largely due to his efforts.

His duties as Professor of Agriculture and Director of the Experiment Station led to the delivery of lectures on agriculture in every part of the State. In this way his personality impressed itself in every direction. Some one said, while sadly referring to his death, "Who now will tell us what we want to know?" He devoted much research to ascertain the best methods of water supply for cities, and early pointed out the danger of supply from wells and polluted streams. He induced the boring of artesian wells to supply the sea-coast resorts, and executed surveys and maps of the watershed of Northern New Jersey.

He took an active interest in the introduction of water into New Brunswick and served for more than fifteen years as a member of its Water Board. He was among the first if not *the* first to analyze the well waters, and to

show the people of his town, that they were unfit for drinking.

He planned the drainage of the Pequest and upper Passaic meadows and accomplished the first and saw work begun upon the last, thus converting worthless and unhealthy regions into fertile and salubrious fields. He brought within the scope of the geological survey, the botany and climatology of the State, and the development of soils, and called attention to the mild and healthful climate of the pine lands and the sea coast, and made known the agricultural value of the light soils. He also organized the New Jersey weather service.

By reason of his knowledge of the changes of coast level, as well as of the history of the controversy, Doctor Cook rendered valuable service as a member of the commission for the determination of the boundary between New York and New Jersey.

He was interested in historical investigation. He knew what people had done, and were doing, and all about them ; every locality for him was teeming with historical association. He manifested a lively interest in the Historical Society of New Jersey, and in the Historical Club at New Brunswick, and was constantly accumulating books and documents relating to Jersey history.

He was one of the founders of the New Brunswick Free Library, and a member of its Board of Managers until his death. He often visited the library in the evening, and, pleased at seeing the rooms filled with readers, would express his conviction, that the library was accomplishing more for the citizens of the town than any other public institution.

In 1870 and again in 1878 the writer had the privilege of traveling in Europe with Doctor Cook. It was certainly like being admitted to a new world. He was at home on so many subjects, and with all sorts of people,

and had not only a general and broad view but technical and detailed information, which he delighted to communicate, in the simplest and most interesting manner. He would often spend whole days, and travel long distances without accomplishing much ; this in no way discouraged him—he would say, "that is to be expected ; another day we shall accomplish more than we anticipate, and so the loss and gain will be equalized." He had a remarkable facility for drawing others out ; after stating in a general way the subject on which he wished information he would let his informant tell his story in his own way, and at length, not interrupting or checking him because he might wander, or give unimportant or irrelevant facts—after he had finished, he might ask further questions. He said talking was necessary for the transaction of business, and that the time consumed was part of its legitimate cost. In this way, while gaining large information in his own lines, he won the confidence of men, and received a vast fund of information on every conceivable subject, which was carefully entered in his note book. These note books must be a perfect treasure-house; he always had one in his pocket, and could refer to what he wanted. Indeed, he made it his business to obtain information general, as well as specific, and after a long day spent in travel and investigation, the evening would be spent in writing up his notes and planning for another busy day, and the morning, before others were awake, in examining maps and laying out routes.

At home he carried on with energy and success as we have seen, not only the geological survey, which alone would have overtasked the powers of most men, but also the agricultural experiment stations and his college work. To all this he added the creation and constant care of the geological museum of Rutgers College. The year before his death he gave the summer, which others were spend-

ing in needed vacation, to supervising the erection of the new Laboratory for the experiment stations, in addition to all the rest—and this when past the age of seventy. Change of occupation, he often said, was sufficient rest. He did not hesitate to assume responsibility when his public work required it.

To illustrate Doctor Cook's devotion to the public welfare, to the sacrifice of his own pecuniary gain, it should be mentioned that, when as State Geologist he was discovering the valuable clays underlying much of Middlesex County as well as other parts of the State, it was proposed that he should drop the survey, and form a partnership with gentlemen of great wealth, to mine and sell the clays ; he declined the offer, which must have led to fortune, preferring that the knowledge should be public property.

Again, when the State Agricultural Experiment Station was established in 1880, in order that the work should not be hampered by even a suspicion of self-seeking (although he was the only man thought of for director, or who could successfully organize it), he insisted that a sum equal to his salary as such director should be deducted from his salary as State Geologist, and then proceeded cheerfully to do work double in intensity if not in time.

Doctor Cook considered it fundamental, that undertakings should be *finished*, and constantly warned his pupils and friends against the habit of going from one thing to another, leaving work incomplete. He often in the last years expressed his uneasiness lest he should not be permitted to finish his own works, which from their nature extended over years. It is a source of satisfaction to his friends, and of the greatest importance to the State, that he *did* live to see his work substantially completed. His labors and attainments extended his fame not only throughout the United States, but among the scientific

men of Europe. He was a member of numerous learned societies; among others, of the Royal Agricultural Society of Sweden; of the American Association for the Advancement of Science (of which he was Vice-President in 1887) of the American Philosophical Society; the Academy of Natural Science of Philadelphia; the American Institute of Mining Engineers, and the National Academy of Sciences. He was also Surveyor-General for the "Proprietors of East Jersey."

He was a member and for a long time an elder of the Reformed Church, always in his seat on Sunday; and for many years this busy man found time to conduct a Bible class. His religion was carried into every hour's occupation, as is shown by the record of his life. He did not talk much about religion, he lived it. He loved God—that is, he kept His commandments; he loved his neighbor as himself; he was not slothful in business; he did what his hand found to do with all his might;—a practical religion, and real, and were it generally observed, the world need not wait for a millennium, nor look to a future existence alone for happiness.

His was a noble life—utterly unselfish, devoted to the public welfare on the wisest and broadest lines. His great scientific attainments, his wisdom, good judgment and marvelous powers of observation and work, were employed during a long life in inaugurating and carrying through great public enterprises, such as have already made life brighter and fuller to multitudes. He never considered his own reputation or ease or advantage. He often said in advising young men, "I have always been doing work which no one else would do." He was simple and unassuming. His friendships and attachments were strong. His disinterestedness and wisdom were widely recognized. Probably no man of his generation has so commanded the public confidence of New Jersey. He

was known and looked up to by all classes from one end of the State to the other, and far beyond its boundaries. His versatility was remarkable and his successful efforts for the development of the State were in most varied channels. He was one of the happiest of men, cheerful, even tempered, overflowing with knowledge and information, delightful in conversation and admirable in every relation, loved and honored throughout his State, and among a large circle of friends and acquaintances in this and other lands. His life is a model for all, which may well be followed. A great and good man has passed away.

DOCTOR COOK AS A CITIZEN.

BY HON. ABRAM S. HEWITT.

THE State of New Jersey is fortunate in being a small State. It has been more fortunate, up to a recent period, in being largely an agricultural State. There has been a certain family and social feeling pervading this State which is unique. I have known the Legislature and its citizens pretty well for about fifty years, and I have found that it is the most Democratic community in the world. This is my judgment. The Legislature represents more closely and more nearly the opinions and interests of its inhabitants than any other political organization which has ever come under my personal observation.

It is true that in ancient Greece, particularly in Athens, where the people come together in mass-meeting and there were no representatives, we have an example of a pure Democracy, which always suggested to me what I have during my life observed to be the fact in New Jersey. Hence, in this State, there is a very close supervision of the expenditure of money, and, forty years ago, there was a great indisposition to expend any public money, for any purpose except the ordinary conduct of government. The State, occupying its peculiar position, between the two great States of New York and Pennsylvania, was to a large extent influenced in its development by the overflow of population, wealth and industry from the neighboring States. Of its own resources it knew but little, and it is a

very suggestive fact that up to 1836, a little over fifty years ago, nothing was known of the geology of this State. In the excitement of that speculative era, some one proposed that Professor H. D. Rogers should be employed to make a survey of the State, and find out what kind of an inheritance had come down to them from their fathers, and it is a curious commentary that Professor Rogers made what is a very remarkable survey, and his compensation for the report which gave us the first knowledge of the geology of this State was the modest sum of one thousand dollars. It was probably the best investment that ever was made by the people of New Jersey.

It insured the development of the mineral resources, particularly in the northern part of the State, upon a larger scale than had ever been possible before, but the State contented itself with this knowledge until about 1856, when Doctor Kitchell revived the public interest in the geological structure of the State and the mineral resources which it might contain. With considerable effort, in which some of the older gentlemen whom I see here present must have participated, the Legislature were induced to organize a survey, of which Doctor Kitchell was the head. He chose for his first assistant a young man little known to the people of this State, and whom, up to that time, I had never had the pleasure of seeing.

When Doctor Kitchell died, after having made three annual reports, one of which related to the marls and green sands of New Jersey, the survey fell into, I was going to say, "innocuous desuetude." At any rate, it was abandoned. But the young man who had acted as the first assistant never lost sight of the importance of continuing and completing the survey. He came to me and asked whether some way could not be made to revive the interest in the matter, and I was satisfied, after talking with him, that there was only one possible chance of

getting the money appropriated and getting the survey reëstablished. That was that that young man himself should go to the members of the Legislature, and let them see what manner of man he was, and tell them what interests the people of this State had in the economic side of the question, leaving the scientific and higher portion of the subject to take care of itself. That man was George H. Cook, then a professor in Rutgers, with a previous record as a teacher in the Troy Polytechnic Institute. I aided him to some extent, introducing him to the members whom I knew. The result was the passage of the act, in 1864, by which the Geological Survey was revived, and the singular compliment paid to Doctor Cook of having him named in the Act, as the Geologist who was to superintend its operation. He was named because of the universal conviction that if he would undertake the work, it would not only be well, but be honestly done. There was not a single vote in opposition to this measure, and the appropriation was made. If I remember rightly, the appropriation was eight thousand dollars, possibly it was five thousand, but I think it was eight thousand dollars.

A Board of Commissioners was established from each congressional district. There were five districts. The original commissioners are now dead, all except four. I believe the other three, with myself, are now in this room. The survey was organized promptly, and Doctor Cook, anxious to have the work done, refused to receive any compensation for his personal services. He was finally persuaded by the Commissioners to take a small sum—very small, I think it was eight hundred dollars—out of the appropriation, because we knew it involved expenses as well as sacrifices, and the survey went on for four years, when what was known as the final report of 1868 was finished. We became very well acquainted with Doctor Cook, I mean the Commissioners. I think of all the men

I ever knew he was the least selfish, and the most cheerful. He was literally a man without guile. He loved this State with a rare devotion. He believed that small as it was, it had in it all the elements of wealth and prosperity, and of political greatness, and I remember the pride with which he turned to the result of the census of 1860, which showed that the agricultural value of the land in the State of New Jersey had increased more than that of any other State in the United States. He used to speak of this State as a natural garden, as a source of supply of all the higher articles of culture, not the cereals merely, but such vegetables as supply the markets of the great cities, and especially of fruits and flowers.

It was his ambition to have the people of the State of New Jersey understand their own resources and possibilities of development, and I am sure that if this State has held its own, as it has, and has advanced upon its condition in 1860, it is largely due to the personal devotion and the untiring industry of Doctor Cook in making known in every part of the State the advantages which it possesses and the best directions in which to encourage development. Along the coast he explored the marls and green sands, and demonstrated the vast, inexhaustible fund of fertility which nature has given to this State in the phosphate deposits of that region. In the central portion and northern portion of the State he was careful to point out that there was a large area of the most fertile land in the world, made worthless by the overflow of the back waters of the Pequest and Passaic rivers. Next he pointed out the enormous value of the clays of New Jersey, which are destined to make it the center of the production of pottery of every kind. The product of that business in this State is now in advance of any other, in the perfection and quantity of the pottery ware. This is entirely due to Doctor Cook's careful work and the manner in which he

made these resources known, not only to the people of the State, but to others outside, who would desire to make use of them in the investment of capital.

Foreseeing that his State must be the center of a dense population, occupying in this country somewhat the same position that Belgium does in Europe; foreseeing that it would require not only pure air, but pure water to maintain a vast population such as must grow up within its borders, he carefully measured the sources of water supply which must lie at the foundation of all development, industrial and social, and he has pointed out that there is no region north of the Potomac river, that is to say between Washington and Maine, in which there is so large a supply of pure water as in the region which is occupied by the northerly portion of the State between New Brunswick and the Hudson river. The watershed of that region is twice as large as the watershed upon which New York depends for its supply—the Croton watershed.

In the course of one or two centuries the density of population will depend entirely upon the ability to get water to drink, and when that time comes the great growth of that State must be in the region which can be supplied from the Passaic watershed. All this Doctor Cook foresaw. He worked for this generation, it is true, but it was less for us than for those who are to come after us, and I predict that in the future the man whose name will be written down upon the page of history as the benefactor of his State, and of his time, will be George H. Cook. The actual achievements of the survey from a scientific point of view are not striking. Scientific problems have been investigated, scientific laws have been proven, and many prejudices have been removed. The old ideas about the igneous origin of the metalliferous formation, have been destroyed, but even if Dr. Cook had not been in the sur-

vey, this would have resulted from the work of other men like Dana and Leslie, and other various geologists, including the distinguished head of the United States Geological Survey, Major Powell, who is here to take part in these memorial exercises, but I am certain that the State of New Jersey would not have had any knowledge worth talking about of its present resources and of the magnificent development which awaits it in the future if Doctor Cook's services had not been secured for the work which he accomplished. That work lasted twenty-five years.

During all that time Doctor Cook went in and out of the houses of this State, making friends of every man, woman and child whom he met. Did anyone ever hear an evil word of him? Did anyone ever hear a complaint? Was not his praise in the mouth of every intelligent citizen of this State? And the fact that he was able to go on for twenty-five years backed by the unanimous vote of the Legislature in the work he was doing, and that no other man ever thought he could do it as well as Doctor Cook, that there never was any candidate spoken of for the place, and that he was served with a loyalty by his distinguished assistants, all of whom have made names for themselves in the history of science in this country, and many of whom will be the leading scientific men in the future, is the best possible commentary upon his career of honor, usefulness and self-sacrifice.

No one of these assistants ever for a moment thought he could take the place of Doctor Cook, and now that he has gone, who can know the man that could have taken his place if his work had not been finished? Yes, he went up into the mountain, he saw the promised land, he took the people of this State with him to the borders, but he was not permitted to enter. But his loyal band of

helpers will see that that work of which he was able only to produce the first volume, and partly prepare the second for the press, that that work will be finished, and will constitute it the monument which, as Doctor Raymond said in his address, he has built to the public good, and to the benefaction of his kind, for ages and ages to come.

DOCTOR COOK AS A GEOLOGIST.

BY MAJ. J. W. POWELL, PH.D., LL.D.

"Yet once more, O ye laurels, and once more
Ye myrtles brown, with ivy never sere,
I come to pluck your berries harsh and crude,
And with forced fingers rude,
Shatter your leaves before the mellowing year.
Bitter constraint, and sad occasion dear,
Compel me to disturb your season due:"

One by one the great men depart. As they pass from the sphere of personal association through the portal of the grave into the world of immortal influence, their deeds and honors are recounted by those who remain. When the last entry has been made, the book opened and the account rendered, blessed is he whose good deeds more than balance his emoluments, whose services to mankind more than equal the honors paid him by mankind, for, "It is more blessed to give than to receive." Thrice blessed is the man whose life and services we commemorate today.

The generation now at the zenith of life succeeds a generation whose zenith was clouded by war. As the great men of that day pass out through the sunset of life, their battle-deeds are told. It is thus that the mortuary ceremonies of this generation echo the clangor of charging squadrons, the shrieking rattle of the battle-lines, and the roar of batteries.

Sequestered from the pomp of parade, from the roar of funeral gun, from the cemetery that hides under marble columns the victims of battle strife, here in the peaceful halls of learning we assemble to commemorate the life of a man whose ways were "paths of peace," whose chariot of progress through the world bore no scythe of destruction, whose life was wholly beneficent, whose youth was devoted to learning, whose early manhood was devoted to instruction, whose prime was devoted to research, and whose old age was devoted to the organization and development of institutions for the increase and diffusion of knowledge.

It falls not to my task to characterize the student life of George Hammell Cook. That his opportunities for training were wisely used is abundantly demonstrated by the monument of success which he unconsciously reared for himself in the years of his public activity. It is not in my province to speak of his professorial life. The scholars and public men who were guided into a higher intellectual life constitute a living monument to his fidelity and genius as an instructor. It was as a man engaged in research that I first knew Professor Cook and learned to honor his untiring industry, his deep insight, and his intellectual integrity. The catalogue of his contributions to science is long—too long to be recounted here, for it constitutes the annals of a long life. Only a few examples can be used to illustrate the wealth of his accomplishments—in chemistry, geology, and geography.

In 1854 Doctor Cook became an assistant on the Geological Survey of New Jersey. This was his induction into scientific work. For three years the field of his research was in the southern part of the State, in the marl-beds and amid the potter's clay. Up to that time little attention had been given to these sources of wealth and fields of industrial operations. While in this field of labor he

discovered that a thorough geological survey must be based upon geography, and he constructed a topographic map expressly for the representation of geologic structure. His stratigraphic determinations were based largely upon instrumental measurements and carefully drawn plans and profiles of the land surveys. Thus was inaugurated in America a system of geological surveying which has gradually obtained ground until it is practically universal. The anatomy of the earth is exhibited in its topographic forms. Plains, valleys, terraces, hills, and mountains are full of meaning to the geologist, for in them is revealed the deep-seated structure of the earth and the history of that struggle between the great geologic powers which is forever in progress and from the throes of which the continents are born.

The theater of these early operations was near the coast, where the tides of the Atlantic ceaselessly surge to devour the land. Here his trained eye observed phenomena that led to a long system of observation and investigation, by which he ultimately demonstrated that the margin of the Coastal Plain of the Jersey shore is slowly subsiding, and that the sea is steadily enlarging its dominion. This work, as it has progressed through the years until his death, constitutes an important contribution to the facts and philosophy of the science of geology which he cultivated.

In 1864 Doctor Cook was appointed State Geologist, and held the position until his death. His first task was found in preparing an elaborate exposition of the mineral resources of the State, which had been brought to light by earlier surveys, and he added to these a series of special investigations such as were required for the symmetric treatment of the subject. This exposition was completed and published in 1868 in a large octavo volume accompanied by a portfolio of maps. He thus at the

beginning cleared the field, systematized the existing knowledge, and developed a comprehensive plan for the researches which he carried on until the day of his death. To him geology was not wholly a speculative science. His conception of the duties imposed on him by being entrusted with public funds urged him to administer his trust in such a manner that the welfare of the State might be promoted thereby. He did not neglect the great philosophic problems of his science, for he directed the investigations of the Survey into structural geology, paleontology, chemistry, and geography; but he held over these researches a constant corrective by making them responsible for exact determinations of industrial value. A series of great economic problems was forever in his mind: How can these inundated lands be regained? How can the broad fields of New Jersey be fertilized? How can the potter's art be developed from the clays of the Coastal Plain? How can the deposits of zinc be utilized by the industries of the State, and how can the great beds of iron-ore be transformed into the instruments of modern civilization? And he applied the principles of science to these problems. Geography, geology, paleontology and chemistry were all made subsidiary to the leading purpose of his survey.

Science was thus made to bless mankind, and the advancement of science did not lose thereby; science and industry in copartnership were each strengthened; industries of great magnitude and value to the people were steadily developed, and science itself steadily grew under the genius of his guidance.

The State of New Jersey is the seat of ancient seas. From the sediments therein deposited the rocks of the hills of New Jersey were made. The history of New Jersey through long geologic time is a history of innumerable earthquakes consequent upon the upheaval and

depression of its lands. At one period in its history it was the scene of vast volcanic activity, when molten rocks poured to the surface. Built by the sea, it has been fashioned by the storm, and the waves of ocean have carved its shores with a fret-work of beautiful forms. Its low shores, its coastal plains, its broad valleys, and its billowy hills have been carved by rains and rivers until it presents a landscape of beauty. These physical features of the State, which express its beauty and record its history and reveal its structure, became one of the great studies of Doctor Cook when he began the topographic survey of the State. He lived to see that survey completed; and he gave to the industries of the land and to the science of the world the first great topographic map of a State constructed on this continent. Had this been his sole contribution to the knowledge of the world, it would have made him worthy of high honor.

With the increase of population in this country, the ordinary wells which gather the water from the surface steadily become dangerous to health and life. With the multiplication of manufacturing establishments and through other agencies, ever on the increase, the streams become polluted and their waters freighted with disease. The supply of pure water for domestic purposes to the people of the State of New Jersey early attracted the attention of Doctor Cook. With profound insight into the physical structure of the State, he early became convinced that the hills of the highlands constituted a catchment area for the waters of deep-seated rocks in the lowlands, and that through these pervious formations, outcropping above, the waters were filtered and purified and could be reached by artesian boring along the coast. His prophecy was fulfilled, and now the beautiful towns of the region are made salubrious through the genius of his scientific induction. Today thousands of wells ex-

tending along our coast from New York to Florida pour out the pure waters of life and bless multitudes of people and make their homes happy. The clouds of the highlands are tributary to the cottages of the coast. and the rocks deeply seated in the foundations of the earth carry them on their way.

Through long years of his life Professor Cook was engaged in investigations relating to agricultural industries. The interests affected by these investigations are vast, for they are at the foundation of all prosperity. The facts and principles to be investigated are multifarious and complex, relating to climate, to soil, to vegetal life and animal life, and to the relations of all these to human life. Science has done much for modern industries in manufacturing, in mining, in transporting, and in commerce; the hidden powers of the world have been discovered and tamed; but science has done comparatively little for agriculture, and Dr. Cook was one of the founders of a vast system of research which has now been established throughout the land on a comprehensive and symmetric plan. Through the agency of these founders, of whom Doctor Cook was one of the leaders, experiment stations have been established in every State of the Union, endowed by national and State grants, and the greatest army of investigators ever organized under the sun is now at work on the complex problems of agricultural science. This was the crowning labor of a long and fruitful life. It has been a quiet, but vigorous and efficient movement, and the people do not realize what has been done. The labors in this cause of this beneficent friend of mankind were untiring. They were conducted among men of affairs, in the seats of learning, in the State legislatures and in the national Congress. Everywhere his benign influence was exerted and felt; his counsels were taken with delight, and he became a leader

of men where only the wisest and best men could be led. His appeal was to scholars and statesmen, and the counsels of this old man eloquent ultimately prevailed.

From the early history of civilization until the present time many great thinkers of the world have been constructing temples of philosophy. It began with Socrates, Plato and Aristotle, and this temple-building has continued through the times of Saint Thomas Aquinas down to Hegel, Schelling and Fichte, and even later to the days of Herbert Spencer. These theorizing philosophers have attempted to construct systems for the explanation of all things in the universe, and to build their philosophy upon a few "fundamental principles"—postulates, presuppositions—constructing temples founded on their domes. One by one these philosophies have crumbled into dust and we know them only by their ruins. The history of civilization is marked by the ruins of fallen philosophies, now most interesting to historic archæology.

In modern times another philosophy is being constructed—the great temple of science. On this structure a vast army of scholars is at work through the multifarious methods of scientific research, and they are building this temple with its foundation on the granite base of fact. George Hammell Cook was a master workman on this temple, building with the facts and principles discovered by modern scientific research.

I knew Doctor Cook best as a counselor and a friend. Having responsibilities thrown upon me kindred to those borne by him, I was glad to seek wisdom at his feet. Honest and pure, he was far-seeing, and for his counsel I owe a debt of gratitude. His ways were characterized by directness aud simplicity, and I learned to love him as a father and to be guided by him as a son. And now the wise old man is gone. This fountain of wisdom flows no more. The processes of time and change never cease.

On we go with the stream of events. Shall our lives also make the world better? The light is from on high. The powers of the earth come from the heavens. They who have wielded these powers best are placed in the firmament of history.

The method of human progress is not through the survival of the fittest, for man is more than brute.

The agency for the progress of mankind is the influence of the fittest. In all ages this has been recognized, now clearly, now dimly. In harmony with its principles, those who have best served humanity have been placed on high among the stars of our history, that the light of their immortal deeds may forever shine upon the pathway of mortal men.

George Hammell Cook is among the stars. On earth he loved justice and rendered justice; he loved the truth and sought the truth; and, dead, he lives again, the star of justice and truth. O, venerable friend, your counsels were wise and your example beneficent; shine on, to illumine our way to the truth and the right with the light of the knowledge of the glory of God.

DOCTOR COOK AS A MAN OF SCIENCE.

BY THE REV. J. B. DRURY, D. D.

I HAVE been invited on this memorial occasion to speak a few words on Doctor Cook as a man of science. He was a many-sided man, well recognized in the arrangements for this commemorative gathering. Others have been requested to speak of him as a teacher, a devoted citizen of New Jersey, the head of a geological survey and as a colleague in college work, in each of which spheres he won distinction. But, concededly great and useful as he was in all these capacities, his eminence as a man of science is even more surely and deservedly established. As a scientist, he possessed qualities which command remark and admiration.

He was so thorough, so indefatigable, so broad, so exact, so independent, and withal so modest and free from personal ambition, that in him we find a rare combination, which serves to explain the high distinction he won and the influence he exerted, both among his scientific associates, his pupils and the common people. He possessed in an eminent degree the scientific mind. He was a close and accurate observer. No detail escaped his inquisitive attention. His power of analysis was keen, neglecting no factor entering into phenomena. In synthesis he was equally exhaustive, ever careful to omit nothing essential

to the result. His mind was ever open to receive new light, and so unwedded to theories was he that each new discovery found with him an unbiased consideration. His patience in investigation was only equalled by his persistence in seeking and proving new data, whether confirmatory or destructive of the old. He discovered and announced more than thirty years ago the subsidence of the Jersey coast, and almost his last journey was to the shore after the storms of last Fall, to examine on the spot the ravages of the ocean and weigh their bearing on this well-established fact.

A few years ago he attended and addressed a meeting of the American Association for the Advancement of Science at Montreal, the place at which in 1857 he announced this discovery. He opened his address with words to this effect: "As I stated when I last addressed you in this place"—and immediately the assembly broke into applause in recognition of the true scientific persistence which, after a lapse of thirty years brings confirmatory evidence, gathered patiently year by year. He was slow and cautious in affirmation. Not given to theorizing and modest to a fault, he had seldom to withdraw a statement. Under an impassive demeanor was an enthusiasm which kept him active and zealous to the last in the prosecution of his chosen studies. By reading, by correspondence and personal investigation, he kept pace with the progress of science. Of necessity he was, in consequence, most industrious, frugal in time, yet never so as to despise the humblest channel of information. He kept himself ever in contact with the common people. The fisherman and farmer, the miner and mechanic, knew him, honored him and helped gladly and efficiently in his work. From such sources he gathered facts which, sifted and complemented by his own stores of knowledge, helped to build

up the contributions so important which he made to science.

Doctor Cook's scientific attainments and tastes were broad, but as was natural in the head of a geological survey of a State, they centered more and more in geology, and in that department his specialty was in the formations exemplified in this State, and particularly their structural, rather than their paleontological features.

The annual reports of the Geological Survey, of which he was head, and the volumes published or about to be published, are a monument most enduring to his patient and thorough work thereon, and to his scientific ability. Though his work was not fully completed, he did enough to put him in the front rank, as an original investigator and important contributor to geological science. He cultivated science from love for it and its beneficent fruits, and cared little for the notoriety or fame to be won.

Few took less part in the ventilation of theories or the contentions of schools, yet no one had clearer views or could express them more exactly and in language intelligible to the plain people, and few among our working geologists have contributed more abundantly to the ascertained facts of the science. Among these contributions may be noted :

First. The subsidence of the Atlantic coast, discovered and proven by his observation on the Jersey shore. This was announced in 1857 to the American Association for the Advancement of Science at Montreal, and as we have already mentioned, continued a matter of investigation even to the end.

Second. The discovery of the stratigraphical relations of the green sand marl beds, and the addition to the geological column of newer and important strata, bearing fruit not only in improved agricultural resources, but in

supplying pure and wholesome water to the seaboard communities of the State.

Third. The discovery and outlining of the great terminal Moraine in the eastern United States, running across New Jersey and the adjacent parts of New York and Pennsylvania. It was announced in a paper read at Wilkesbarre before the American Institute of Mining Engineers in 1877, and described in his annual reports for the years 1877 and 1878.

Fourth. His determination with exactness of the stratigraphical relations of the clay beds of the State, so important to the fire-clay and potters-clay industries, and of the geological structure of the magnetic ore beds, of special value not only to the iron miner and the iron ore prospector, but to the geologist and the mining engineer. These important contributions were published in the report of 1878 for the clays, and of 1883 for iron ores.

Fifth. The exhibition by practical application of the value of accurate topographical maps in geological study. Thanks to Doctor Cook, New Jersey is the best mapped State in the Union, and his atlas of New Jersey is recognized as a real contribution to the science of geology as well as geography.

I may not further dwell, nor need I, upon what Doctor Cook achieved as a man of science. I would merely call attention to two marked traits, intimately connected, which preëminently characterized him as a scientist.

First. The emphasis he placed on the practical or useful applications of science. This was so strong that nothing in the way of theoretical or speculative science ever diverted him from the single aim of making his scientific knowledge and discoveries useful to his fellow men. He was not without interest in the philosophy of

science, but that was ever subordinate to his desire to enrich and benefit the people. The utilitarian, economic, practical features of science were what most profoundly interested him and enlisted his energies. His proudest monument today is the riches and increased wealth he conferred by his scientific studies on the State of his birth and later residence. He had not time and was too conscientiously scrupulous to seek riches for himself, his knowledge was never used for personal gain, but no man ever lived in the State who opened so many sources of enrichment to others.

By his study of the marl beds and indicating where this fertilizer could be most economically gotten and how most advantageously used, as well as by his lectures to farmers, giving them the benefit of his science and taking to them the results of most careful experiments, he has made the agriculture of the State vastly more productive than a generation ago. His maps of the clay beds gave fortunes to many, and built up and expanded the great fire-clay and pottery industries of the State. His exhaustive study and charting of the ore beds of the State made mining more certain and profitable. He told the cities by the sea how to get pure water, and added thereby hundreds of dollars to the value of every acre along the coast. One has but to read his reports as State Geologist to see how this economic feature of the work is ever uppermost. To improve the health and increase the wealth of the State, the welfare of the people, by his knowledge, is the end ever held in view. It was successfully executed. A matter of great satisfaction to him, only a day or two previous to his death, was the tidings that the draining of the lowlands of the Passaic, in order to the removing of disease, and opening large stretches of waste land to productive husbandry, for which he had striven for years, had been successfully begun. These

are but a few samples of the chief aim of his scientific studies and pursuits. Thanks to him, New Jersey has the most complete and most fruitful geological survey of all the States, and has become a model for others.

Second. The other characteristic of Doctor Cook as a man of science, furnishes us the clue to the form which his unwearying and scientific industry took. It was his religious faith.

Science spoke to him of God, even as his Bible: and in the pursuit and the application of scientific knowledge, he was ever the consistent follower of Christ. With him, science was the handmaid of religion, and an instrument of blessing. Because a follower of Him who went about doing good, he thought himself under obligation to make his knowledge, his discoveries and his attainments, a source of blessing to his fellow men. Thus science became to him a trust to be used to make men happier and better. And this is the key to the peculiarly unselfish and philanthropic character of so much of his scientific work.

Out of his Christian faith came also that honesty, truthfulness and faithfulness which so characterized him in all his scientific labors. He could and would not vary a hairbreadth from the strict path of truth and duty. A statement by him, ever carried conviction. When his maps of the clay deposits were issued, lands were at once sold and bought on the basis of their trustworthiness; seller and purchaser accepted them as beyond all question, so great confidence had he infused, not only in his science, but in his honesty and truthfulness. His devotion to the beneficent work he was doing, was such that he wrought on a mere pittance of a salary. The whole expense of the invaluable survey was only eight thousand

dollars per year, and the statement "all bills paid and there are no debts," is an invariable part of his annual report. No wonder the State continued such a man in the position. He was more careful of the State's money than had it been his own, and never, we venture to say, did a State ever get more for the expenditure, than from the Geological Survey conducted by the scientist and Christian, Doctor George H. Cook.

He was a man of whom the State, this Institution, the world of science, and the Church of Christ can well be proud. He was a scientist of the highest order, thorough, conscientious, persevering, and successful in seeking, knowing and applying the truths of science. He was also a sincere and intelligent Christian, illustratingin his life the entire consistency of the highest attainments in science with fullest faith in the God of the Bible.

DOCTOR COOK AS A MEMBER OF THE FACULTY.

BY PROFESSOR T. S. DOOLITTLE, D. D.

IT would be impossible for me not to allow the element of personal affection to enter into my estimate of Doctor Cook's character and services as a colleague. A student under him from 1855 (his connection with Rutgers began in 1853), brought into closer relations with him than with any other professor during both the four years of my collegiate and the three years of my seminary life, returning after a brief pastorate of two years to be associated with him as a member of the Faculty for a period of a quarter of a century, enjoying thus altogether an acquaintance extending through thirty-four years, and finding him always "my friend, faithful and just to me"—how can I help betraying a feeling of deepest personal love and of exalted personal admiration! And with my heart aflame in memory of his virtues, why should I attempt to speak of him as a stranger unknown and unrevered!

It was because honest Will Shakespeare had stood the test—every test of friendship and manhood—not only in the fierce ambitions for fame before the footlights and in the free interchange of wit and banter at the coffee-house, but in the rivalries and vexations of the rehearsal behind the scenes, that Ben Jonson's testimony to his character is so valuable. When, therefore, we hear rare old Ben

exclaiming with tearful eyes and a throbbing heart: "I loved the man, and do honor his memory, on this side idolatry, as much as any"—we recognize that he knew at least what his words meant and felt constrained to twine no less a chaplet of praise around the brow of his silent, but more than ever appreciated companion. And so, if we members of the Faculty seem to eulogize our beloved colleague a little too warmly, bear with us, for we come from behind the scenes with a tribute to those traits of his which nowhere else were subjected to such crucial tests, and nowhere else shone with a lustre so untarnished and attractive.

DOCTOR COOK'S HOPEFULNESS.

We realized more than outsiders could, his great-hearted buoyancy and cheerfulness. His broad expanse of face, full of light, his eyes gleaming with kindliness as well as with shrewdness and often with a right merry twinkle, his genial smile, his frank greeting, never marred by any hollow and flippant phrase of mere etiquette, but as honest as it was cordial, his sympathy so responsive yet so genuine, his massive though quiet strength of purpose, and his great self-contained, self-poised nature; all crowned with boundless hopefulness, united to make his very presence an inspiration and a benediction.

With a consummate knowledge of human nature, John Bunyan portrays Hopeful as the fellow pilgrim of Christian along the way to the celestial city. And when Christian wanders from the true path and they get into difficulty, Hopeful, with characteristic modesty and charity, says: "Never mind, brother, I forgive thee, only let us turn this disadvantage to our profit." Again, when a little later they find themselves shut up in a dungeon of the castle belonging to Giant Despair and poor Christian

is tempted to suicide, it is Hopeful that rises equal to the crisis and persuades his despondent friend to thrust the key called "promise" into the prison lock and give it a turn. He does it. The door flies open and they escape. Well, Doctor Cook was our Mr. Hopeful. How apt and skillful he was in converting a disadvantage into profit He was an expert in opening locks with the key of promise. His courage was contagious. He never despaired himself nor allowed us to despair. Many a time we followed him from the darkness of doubt into the open day of faith.

HIS FERTILITY OF RESOURCES.

Nor was he less versatile than hopeful. He was always projecting new plans for improving the curriculum, for multiplying professorships, for erecting new buildings, and for bringing the scientific department into more vital relations with the State, so as to widen its usefulness and influence. Here are a few instances of his versatility and perseverance. This institution upon his arrival was destitute both of scientific collections and an exhibition hall. He did not, however, deem a beginning useless, nor did he despise the day of small things. It was one of his grandest characteristics never to despise the day of small things, but to detect an oak in an acorn and to predict the century flower from the germ of the century plant. Accordingly he organized his classes into a natural history society and kindled among them a flame of enthusiasm akin to his own for gathering minerals, birds and insects, coins and curiosities of all kinds.

But at what a pathetic cost to himself and his scientific future was this work carried on! Think of the priceless value of such a man's time; think of those superb energies of his frittered away upon us when they might have

been utilized in making discoveries promotive of his reputation and power. You must concede that his patience in listening to our crude papers and in flooding with light our ignorant discussions was heroic, not to say fairly sublime; while his delicacy and tact in concealing our imperfections from ourselves and in stimulating us to higher attainments were as beautiful as they were helpful. Nor were his efforts vain. One of us brought him a crocodile from Florida; another a flamingo and turtle from the Bahama Islands; another the bones of extinct animals from the marl beds of New Jersey; another copper nuggets from Lake Superior, and others, gold and silver ores from Colorado and Nevada. Nor was this all. When Doctor Cook heard of rare and valuable specimens which their owners would not donate, and the money for which he knew not where to beg, he would buy them himself and would point to them with a tone of satisfaction which it made one happy to witness, though he never gave a hint of his own unselfish liberality.

One day, while inspecting some remarkable fossil tracks, which were among the finest in the whole world and were enough to have made the face of Hugh Miller glow like a star, I asked: "What did they cost?" "Oh, I don't know; between one and two hundred dollars, I suppose." "Where did you get the money?" "Oh, I got it." "Did the Trustees furnish it?" "Not that I know of." "Did you thrust your hand into the pocket of some alumnus?" "I guess not," he replied, with a characteristic shrug of his shoulders and shake of the head. "Well, where did you find it?" "Oh, no matter; I found it." "Ah, I see," said I; "you have been playing another one of your tricks upon your own purse." "Perhaps so," he replied, while his eyes were laughing and sparkling; "but you needn't say anything about it, though." In the same way Doctor Cook gave hundreds, rather, I believe

from what I learned incidentally and at different times, thousands of dollars in order, to quote his favorite expression, "to make things go." And things did go! When he came a carpetbag would have held all our collections. Long before his death they had so expanded as to make yonder geological hall, with its spacious and noble museum a necessity; and it rose in response to his earnest wishes.

After it was finished he needed some two thousand dollars for cases. His hope ran into faith. "I'll venture," he said, "upon a new method. I'll have the cases built and filled with such attractive exhibitions as to tempt the pride and loyalty of the alumni to pay for them." It was done. His fertility of resource came out on another occasion when the college wanted more apparatus. He devised a course of lectures to be given by Doctors Van Dyck and Rockwood, and then persuaded the managers of our factories here to bear the expense in order to afford free instruction to the masses. The plan was as successful as ingenious, and with the net proceeds, some seven hundred dollars, the apparatus was secured.

If we wanted the State college to become united with Rutgers, or an agricultural bill passed at Washington, or an appropriation from our State for the construction of New Jersey Hall, with its well-equipped laboratories, we turned instinctively to Doctor Cook; for he knew the leaders of the national administration, the Senators and Congressmen, the Governor and Assemblymen—in short, every prominent man concerned, and could harmonize them all, if such a thing were possible, in favor of the desired object. It was he who by his lectures, delivered from town to town, popularized science and made it profitable for the farmers. It was he who reminded the county schools and their superintendents of the free tuition at Rutgers for the brightest and best boys in those

schools. It was he who made many a parent believe that the richest legacy he could leave his son would be a disciplined brain and a sanctified heart. His influence was a tower of strength for our scientific college, for whilst the other professors did their work on the inside, and did it well, Doctor Cook's agency extended to the outside as well as inside, and was forever attracting public attention and support. Is it strange that we learned to lean on such a man and fell into the habit of trusting him?

If, as will sometimes happen, the veil of uncertainty and distrust seemed to hang over our future, Doctor Cook's strong arm would draw aside the veil and point out signs of promise which the rest of us had either failed to observe or rightly to interpret. In many a trouble we heard his buoyant voice and walked in the light that flooded his eyes. "Never mind the present discouragement," he would say; "let's do our duty with what we have; Providence, depend upon it, will send us something better after awhile."

Though not a dreamer, he yet agreed with Emerson that it was wiser as well as pleasanter to see castles than dungeons in the air. No wonder we loved his society; he came among us when we were depressed, like the outburst of the sun from behind a cloud.

HIS SELF COMMAND.

I do not mean to affirm, however, that Doctor Cook was nothing but a peddler of sweet hopes and delicious amiabilities. He was a man of like passions with ourselves, capable of smarting under an affront and of yielding to a momentary gust of temper. His was no nerveless and flabby organization, like that of an octupus, which can be sliced away by inches without causing a

twinge of pain or reaching a vital part. On the contrary, he was keenly sensitive, naturally quick and impulsive; but he had acquired the art of rigid self-control. Under strong provocation his eyes would flash, his cheeks flame, his lips quiver, his robest frame shake with indignation and righteous wrath; but he would stand still, wrestling with himself and allowing no unguarded word, often no word at all, to escape. Such an impressive and masterful illustration of self-conquest has often reminded us of the inspired writer's eulogium: "Verily, he that ruleth his own spirit is greater than he that taketh a city." The conqueror of cities has generally shown himself a grown-up and spoiled child, peevish, fretful, intolerant even of a courteous difference of opinion. Alexander, for example, when his vanity was piqued, sent a javelin through the heart of his best friend and ablest general for having ventured to criticise one of his campaigns, and then in a second fit of ungovernable remorse turned his sword toward his own bosom, and would have died a suicide had not an officer's hand turned aside the point.

What a contrast with all this was Doctor Cook! He not only welcomed the widest and freest discussion, but could bear the stoutest opposition. Nor would he ever assume an air of mortification and injured innocence, if he happened to be voted down. Habitually and delicately considerate of the feelings of others, he would rarely antagonize directly our purposes and plans, but would seek to overcome them, either by progressive suggestions or a final adroit substitution of his own. He cultivated good nature as he did self-command, and this with the aid of divine grace resulted in his attaining one the most uniform and charming of dispositions. In the clashing of ideas and interests, common to all bodies like a Faculty, he never gave any of us—that I can remember—one harsh

or bitter word. Such a character was, as might be expected, remarkable for

THE FIDELITY AND PERMANENCE OF HIS FRIENDSHIP.

A secret confided to Doctor Cook's ear was as safe as if hidden behind the impenetrable veil of the Egyptian Isis forever. Prudent in advice, he sought to promote only our truest relations and welfare. If sometimes he were indirect in his ways, if in a crisis of excitement and incipient hostility between you and another he hesitated and did not stand up quite so openly and emphatically as you could have wished; if, in short, he were exasperatingly cool-headed and non-committal, you realized, after it was all over, that he had not been actuated by any disloyalty, but only by the habitual caution and self-restraint to which he had schooled himself. Besides it was his instinctive policy never to widen but rather to bridge the chasm that divided friends, and a bridge must, from the nature of the case, touch both sides of the opposing banks.

His own resentments quickly vanished into charity and good will. I was one day walking with him when he saw a graduate on the opposite side of the street, looking somewhat perversely in the wrong direction. Doctor Cook said: "Do you notice that the gentleman over there does not want to see me? He did not behave quite as he ought to have done in college. Never mind. Let's go over and pass the time of day with him, just to show him that we wish him well!" Yes, O thou model of a peace-lover and peacemaker, thou didst unfailingly wish everybody well, and didst go out of the way, and how often at the sacrifice of personal pride, to disarm and win back the disaffected; yet never in a cringing spirit, nor with the patronizing air that is so offensive, but with a frank

and manly bearing that was as irresistible as it was noble. That disgruntled graduate was captured. His heart was overborne by the better heart of his master. Subsequently he spoke to me in grateful terms of his old teacher's magnaminity, as well as with admiration of his greatness. Here was a typical case, showing his Christian willingness, commended by our Lord, to leave his gift at the altar, while he went off after the alienated brother, who ought rather to have come to him. This spirit made him

THE MOST HELPFUL OF MEN.

How glad he was to build the stairway which his former pupils might ascend to higher activities and honors. On one step of that stairway stand Vermeule and Bennett, Bevier, Sproul and Van Brackle, Atkinson, Staats and Blakeley, the two Hills and Luster; all of whom he taught to delineate the finest geological and other maps of which any State in the Union can boast. On another step stands Mr. I. S. Upson, our efficient Librarian and the clerical head of the survey. On another stands Professor F. A. Wilbur, whose analyses of water, soils and fertilizers are authoritative in all the counties of the State and beyond. On another stands Doctor Francis Cuyler Van Dyck, whom the master trained for his own colleague in chemistry, physics and electricity, and who has always been as warmly loved for his talents as he is highly respected for his unwearied devotion to his duties. On another stands Doctor John C. Smock, who made so excellent a name for himself as Assistant State Geologist that the Board of Regents in the neighboring Empire State felt constrained to invite him to come up higher as Director of the great museum at Albany. On another stands Edward A. Bowser, L.L. D., for whom Doctor Cook obtained the

chance to display on the United States Geodetic Survey unrivaled capacity for making accurate and difficult triangulations and whom he was delighted, as we all are, to see climbing up and up with his enormous load of seven mathematical works, embracing two thousand eight hundred pages of original profound thinking, works already used in nearly ninety colleges in the United States and Canada—climbing up and up until his head fairly touches the stars and comets upon which he lectures with such masterful eloquence.

Doctor Cook had the art of making his students believe themselves competent to do good work, and the faith to commend them to the parties desiring such work. Nor was he less generous of his sympathy and helpfulness elsewhere. Farmers and plain folks flocked to him from all quarters for counsel and on a vast variety of topics. And from him no inquirer after knowledge ever went empty away.

HIS WISDOM.

Doctor Cook was a wise man. As far back as Democritus the distinction has been made between learning and wisdom. Learning embraces multifarious knowledge in one department or several. Wisdom lies in choosing the noblest ends and the application of the best means for their attainment. A man may be an encyclopædia of the languages or the sciences, and yet may be bereft of common sense—a fool. Buffon was fond of the paradox that common sense was the most uncommon of endowments. Now, Doctor Cook's mind was indeed an open library of information. His acquaintance with facts and corresponding theories was amazing; but no one was wiser. He knew when speech was silver and silence golden. He took in a situation intuitively and with

unerring instinct selected the best agents for the accomplishment of his aims. He understood whom to aproach and whom to leave severely alone. Absolutely without vanity, he was content to get things done, and never concerned himself as to who might reap the glory. Too magnanimous to be piqued or soured by any fancied or real slight, he never drew back his hand from the plough, nor hesitated on account of personal antipathies or misunderstandings or envy to coöperate with others in driving it forward.

I have seen him smile with imperturbable good nature at an individual differing violently from him in opinion, and in such an *argumentum ad hominem*, half-abusive style that had the Doctor possessed less wisdom or less self-control he would have retorted with anger and made the breach irreparable. And yet I have seen him using that same individual afterwards with immense advantage to himself and his schemes. He would defer, but never let go. Always casting the horoscope to see if the moment were ripe for unveiling his ulterior purposes, he could, nevertheless, if the auspices were threatening, remain quiet and bide his time. Disappointed in one direction, he would try in another and another. The more he was baffled the more fertile he became of expedients, until at last he surprised his friends, possibly himself, by the final success of plans supposed long before to have been abandoned. The variety and value of his actual achievements attest the wisdom of his methods as well as perseverance of his will.

HIS STRENGTH.

He was strong in physique, in endurance, in energies that seemed never to rest. If I happened to be up at midnight and glanced toward his study window, the light

was blazing there, and his large head, reflected against the curtain, was seen bending over his task. If sickness or a journey roused me before dawn of a Winter morning, I would see that light already kindled and that same head again bending at the desk. I used to wonder when he slept or if he ever slept at all. Nor was he less strong in his mental and moral traits. He was stalwart in his purposes, in his friendships, his faith, his usefulness to men, his worship to God. Brave and unselfish, exceptionally modest and unpretentious, he was devoted to the loftiest ideals of scientific culture—a scientific culture, however, always subordinate to Christian manhood—never an end in itself, but only a means for enlarging human virtue and glorifying our Maker. Charitable to the faults of others, catholic in ideas, he allowed no narrow conceptions of science, though its utilities were his constant and favorite theme, to close his eyes to the importance of metaphysical investigations or the problems of moral philosophy. His mind was evenly and admirably balanced. He believed in a complete education, in the symmetrical training and informing of all the faculties as the essential preparation for special lines of research. His interest in young men was unbounded. He loved to dwell upon their promise and forecast their future. Who could surpass him as a patient listener or a considerate sympathizer? How responsive he was to the hopes and plans of others! how ready to aid them as if his own! I have heard his disinterestedness impeached by the captious insinuation that he always had some axe to grind. Well, his axes were of such finely tempered steel and designed to cut down such thickets of ignorance and error that most of us were contented to turn grindstone, and bid Godspeed to his axes. Nor was he lacking in reciprocity. He would take off his coat and turn your grindstone, too, with a royal will and to excellent purpose. His principle

was, "Live and let live." Hence his workmen were often overpaid—paid more than the stipulated wages, and his favors to you would be larger, if the chance permitted, than yours toward him. His purse was at the mercy of the benevolence beggar. Public spirited, he contributed to everything, and often more than he could afford.

Like Louis Agassiz, he never had time to make money, though he might have been one of the richest of men. Twenty years ago, as he told me himself, he resisted the most tempting offers to act as a mining expert—offers which, as subsequent events proved, would have rolled between one and two millions of dollars into his possession. By his drill he discovered those white clay deposits about Amboy and Woodbridge, which raised the land over them from one hundred dollars to several thousands an acre; yet his freedom from covetousness kept him from taking advantage of his knowledge to purchase a single acre of the unsophisticated and unsuspecting owners thereof. A critic once said of him, with a touch of envy, "Doctor Cook is the recipient of three salaries—one from the College, as professor; a second from the State, as geologist; and a third from the Agricultural Experiment Station, as director." Well, my friends, I wish he had received six instead of three, for he managed to distribute those salaries so liberally as to have little left for himself. From no good cause did he hold anything back, either gifts, time, talents, energies, or life itself. With arduous labors he wore himself out, and passed beyond the veil at an age when his eye ought yet to have been undimmed and his natural force unabated.

How could all these qualities fail to render our colleague a magnet, drawing us to himself for safest counsel and in the sweetest amenities of friendship? In many a dark and anxious hour he was for us the lighthouse on the cliff, and now, since death has quenched the lamp

within the house, leaving us to navigate the ship in the shadow, how can we express our emotions more fittingly than in the words of Xenophon in regard to Socrates, "Our master was so pious that he did nothing without the advice of the gods; so just that he never injured any one in the least; so completely master of himself that he never choose the agreeable instead of the good; so discerning that he never failed in distinguishing the better from the worse; in short, he was just the best and happiest man possible."

HIS GREATNESS.

Is this the overdrawn tribute of affectionate and blind partiality? Or was Doctor Cook a truly great man deserving it all? We think he was. For while the very simplicity of his character and the unostentatiousness of his spirit might cause a stranger to ask: "Wherein lies his greatness?" yet to us who were familiar with the sweep of his inventiveness and the diversity of his projects and methods he was always revealing new elements of a great as well as noble soul. The twin proverbs, that "familiarity breeds contempt," and that "no man is a hero to his valet," are where real greatness is involved as stupid as they are false. If a man be a hero at all, he is a hero most of all to those who know him best. And can anyone who knew Doctor Cook well deny that he possessed a genius for multiplying the beneficent utilties of science and for enlarging the resources of human happiness! When it is remembered that although intensely patriotic, he had no taste for military campaigns, in which generals purchase distinction at the price of blood; and that he had no abilities for popular oratory which often win the show without the substance of fame; but was wholly absorbed in the homelier benefits of industrial progress, in those

benign arts of peace whose blessings are often in the inverse ratio to their lowliness; and yet that by these inconspicuous instrumentalities he somehow managed to impress his ideas—himself—upon countless multitudes of his fellow-citizens in and out of the State, so that his prolific suggestions for bettering the condition of labor and society were quoted all over the Union and translated into foreign languages of European journals, it must be admitted that he bore the test whilst he exercised the prerogatives of a great, a very great, leader of mankind. If the value of life and the rank of renown are to be measured by work done, then the great survey alone, to say nothing of the all else he did, will form a historic monument to Doctor Cook's genius and usefulness. Hence, since his removal from earth, the remark more and more often comes from competent and impartial judges, that he was the most eminent as well as most useful contemporary citizen in New Jersey. Certainly of this citizen it may be remarked, as Victor Cousin said of Sainte Beuve, "This man seems not so much a limited person as an impersonal force, a diffusive, persuasive force." His presence filled all our buildings and hovered like an atmosphere over the campus. We came into contact with him at so many points. He was everywhere and doing everything. And when the grave swallowed up this restless force, what wide, empty spaces were left, and alas! how lonely! He had made himself so necessary, so delightful, to us all, that each of us dreamed he had been the most intimate with him, the most honored with his love and confidence, and had therefore suffered the deepest personal loss by his sudden taking off. The startled outcry of David, when beholding on Gilboa's heights the beauty of Israel prostrate, seemed to be our individual lament: "Ye mountains of Gilboa, let there be no dew, neither let there be rain upon you, nor fields of offerings.

* * * How are the mighty fallen in the midst of the battle. O Jonathan, thou was slain in thine high places. I am distressed for thee, my brother Jonathan; very pleasant hast thou been unto me; thy love to me was wonderful, passing the love of women. How are mighty fallen and the weapons of war perished!"

Perished? Is then our friend and brother dead? Nay; are not we rather among the dead and he among the living? Translated to yonder pure realm, his astonishing capacity for work developed under difficulties here knows no cessation nor impediment to success there; his fondness for discovery, the most unalloyed source of happiness here, mounts upward to endless gratification there, making his blessedness complete. Nor has his life, though translated, vanished altogether from these, its former scenes and companions. For just as the rays of some fair and far-off star in the sky continue to leap across infinite spaces and to greet the denizens of this earth for ages after it may itself have been extinguished, so the influences of the great and good shine on after the mortal tabernacle that held the immortal spirit has crumbled into dust, and they will shine on forever and ever.

LETTERS OF REGRET.

The following letters of regret were received:

NEW HAVEN, May 12th, 1890.

PRESIDENT GATES:

My Dear Sir—Your letter of the 7th relating to the commemoration exercises with reference to Professor Cook, has been received. His death was to me the loss of an old friend. We were not often together in our work, but our long labors have been for a common purpose, and with mutual interest in one another's results, and I have always found my esteem for him increased with each new contribution of his to science. His published reports were always the outcome of earnest work and good judgment, devoid of all self-seeking, and showed the broad man who could investigate principles and also study out the many practical applications connected with the special subjects before him, and owing to the largeness of his heart and his sense of duty to the State which employed him, the latter sometimes seemed to give him the greater pleasure.

It is a satisfaction to do honor to such a man. But, on account of the state of my health, I regret to say I shall not be able to be present and take part in the commemoration exercises. My sympathy will nevertheless be with you.

Very respectfully and truly yours,

JAMES D. DANA.

NEW YORK, May 19th, 1890.

PROFESSOR T. S. DOOLITTLE, Rutgers College, New Brunswick, N. J.:

Dear Sir—I regret to say that the expected telegram arrived this morning, and unexpectedly requires me to start in a few hours, thus putting beyond my power the fulfilment of my promise. All that I can do is to express by this letter in hasty outline the impression which was made upon me by the labors and publications

of my friend, and which I should have been glad of the opportunity to utter in a more deliberate way and a worthier form.

The leading characteristic of Professor Cook's scientific work was conscientious fidelity. This was evinced in his conduct of the New Jersey State Geological Survey in two striking particulars:

First—He never forgot that as the State Geologist he was the servant of the State. He did not consider himself as called upon or authorized to go beyond the limits set by the expressed will of the Legislature, in order to build better than they intended who had employed him. It too often happens that scientific men in public service regard the grants of authority and money which they secure as so many "entering wedges," by the use of which they may gradually lift the popular representatives to a higher plane of wise liberality. There is, in my judgment, a proper and praiseworthy way of accomplishing such an education of public sentiment. But I am equally convinced that it is not the way sometimes pursued, of concealing ultimate purposes, and of inaugurating expensive schemes for which no provision has been made. The true policy, it seems to me, is to do the simpler duty first prescribed with such conspicuous economy and intelligence, and make the usefulness of its results so clear to all, as to inspire among laymen a confidence both in the value of science and in the good faith of its representatives. This, at all events, was the course of Professor Cook. It is a noteworthy peculiarity of his work that it was not primarily made the vehicle of new and brilliant theories, or of any personal display. Generalizations and speculative inquiries were put in the back-ground; and those things were studied and described which could be made most immediately useful to the citizens of New Jersey. The mere list of the most valuable and notable results of the New Jersey survey, given by Professor Smock in his appreciative biographical notice of his former chief, is a striking illustration of this characteristic. It includes the differentiation of the three green sand and marl beds and their relations to the betterment of the soils; the geological structure of the overlying formations, and the guide to abundant supplies of excellent water in the southern part of the State; the description and accurate survey of the clay beds, and their value as sources of refractory materials; the explanation of the structure of the magnetic iron ore beds, and the methods to be followed in locating mines; the drainage of the Pequest and Passaic river valleys; the surveys of the watersheds of the northern part of the State, pointing to the great natural reservoirs of water for city supplies; and the topographic maps, unsurpassed in their accuracy and detail of delineation of the surface features of the whole State.

In other words, as an officer of the State, Professor Cook deemed

it his duty to be especially an *economic* geologist, and to elucidate first of all the relations, in his appointed field, of geology to mining, agriculture, draining and water-supply. The result was that the people of New Jersey did not need to be "educated up" to the point of feeling that his work was useful to them. They had the demonstration before them.

Second—But he was not a man to seek a superficial appearance of usefulness by hasty work. If his sense of duty led him to follow the investigations which promised immediate practical return to those who had trusted him with public office and public money, it also bade him serve the State by accurate and thorough work. And thus he earned the confidence not only of those who beheld the results of his labors, but of those likewise who were competent to criticise the work itself. Scientific men everywhere trusted his observations. He was never suspected of warping or overlooking a fact in the interest of a theory, or even of going into the field, theory in hand, to observe the facts through that medium. His candor and caution were notorious. And the clear, temperate, deliberate conclusions at which he ultimately arrived, are firmly established by his patience and care.

It is worthy of emphatic comment also, that Professor Cook was not given to controversy. His habitual attitude was one of not so much "fighting for the truth" as *seeking* for it. Nor can I recollect any instance in which he spent his energy in vindicating his own originality, priority or consistency. He let his work speak for itself, and left his reputation to the unsolicited recognition of his fellow-workers. The universal esteem in which his name is held constitutes the best proof of the wisdom of his policy in this respect.

The final volumes of the State Survey, though not completed by his hand, will be everywhere regarded as his work. Indeed, it seems almost like a providential concession to his earnest and humble abnegation of self that these books should be issued after his death. They will be, as it were, a monument, founded, raised and carved by him, to which we supply only the one thing which he forgot to add, when we reverently engrave upon the blank entablature his honored and beloved name.

Yours truly,

R. W. RAYMOND.