MEMOIR

OF

JAMES HENRY COFFIN.

1806-1873.

BY

A. GUYOT.

READ BEFORE THE NATIONAL ACADEMY, APRIL 24, 1874.

BIOGRAPHICAL MEMOIR OF JAMES H. COFFIN.

MR. PRESIDENT AND GENTLEMEN:—

AMONG the sad losses which science and the National Academy have sustained during the year just elapsed, we have to record with deep regret that of our esteemed colleague, JAMES HENRY COFFIN, LL.D., late Prof. of Mathematics and Astronomy in Lafayette College, at Easton, Pennsylvania. His untimely departure is the more to be deplored by us, because he was, at the time of his death, engaged in summing up the results of long years of patient study in a department of scientific inquiry which has, as yet, few representatives among our members.

Professor Coffin was born in Williamsburg, near Northampton, Mass., on the 6th of September, 1806, and died on the 6th of February, 1873. He was a descendant, in the fifth line, of Tristram Coffin, the first owner of the Island of Nantucket, who traced his ancestry to Sir Richard Coffin, Knight, one of the companions of William the Conqueror of England, in 1066. He thus belonged to that hardy, persevering, and intelligent race of New England pioneers, who have done so much to mould the character, and advance the civilization of the American nation.

The sterling and efficient qualities of his race were exemplified by Prof. Coffin throughout his laborious life. Left an orphan, he was educated by his uncle, the Rev. Moses Hallock, and graduated at Amherst College in 1828. Soon after, however, he made for himself an independent career by teaching, and founded, at Greenfield, Mass., one of the first and most successful manual labor schools in the country, on the Fellenberg system. Having left Greenfield in 1836, he took charge of the Ogdensburg, New York, Academy. There, while Principal of this Institution, he began, in the field of Meteorology, that regular series of investigations which he pursued, with characteristic devotion and perseverance, to the end of his life. In 1839 he became a member of the Faculty of Williams College, and in 1846 was

called to the chair of Mathematics and Astronomy in Lafayette College, which he filled to the time of his death. Twenty-seven years of untiring labor, carried on in a truly self-sacrificing spirit, amidst circumstances which might have discouraged a less noble nature; his great success as a teacher; his quiet, but never flagging, enthusiasm, and the beneficent influence he exerted on his pupils, made him one of the main pillars of that institution during a long period of great depression. He lived, however, to see Lafayette College rise to the honorable position she now occupies among the American seminaries of learning.

Professor Coffin was a member of the American Association for the Advancement of Science, and was chosen a member of the National Academy of Sciences soon after its foundation. He was a constant contributor of valuable papers to both these scientific bodies.

In the department of mathematics and astronomy our lamented colleague contributed works on "Analytical Geometry," on "Conic Sections," and on the mode of calculating lunar eclipses, all of which have rendered valuable services to education. But it is in the field of meteorology that he showed himself an original investigator and the discoverer of new truths. Meteorology began to engage his attention almost as early as his college days, but his systematic investigations date from the year 1836. The element of atmospheric temperature and the laws of its daily, monthly, and annual variations had been tolerably studied. He now turned his attention to the much neglected and difficult subject of the winds, studying their course, direction, velocity, and force in connection with the variations of the barometer, the temperature, and the fall of rain. He soon found, however, that the ordinary observations with the wind vane were insufficient for his purpose. Not having at his disposal the instrument he wanted, like all original observers, he devised and manufactured one himself. The result was a self-registering anemometer, giving the direction and duration of winds for every quarter of an hour. This instrument was described by him in a paper read in 1849 before the American Association for the Advancement of Science, at its meeting in Cambridge. It was used by him at Williams College, and on the summit of Greylock, 3500 feet above sea-level; also at Lafayette College for many years, and was found so convenient, that Prof. Coffin was requested to furnish an

improved duplicate of it to the new observatory constructed at Cordova, in the Argentine Republic, under the superintendence of the astronomer, our colleague, Dr. B. A. Gould.

But the requirements of meteorology are peculiar. However large and accurate the number of observations at one place may be, they are insufficient to solve the problem in question. In other departments of physical science co-operation may be only desiderable; in the study of the atmosphere, whose movements are so wide and so extensive as to embrace almost the globe in their simultaneous action, co-operation is indispensable. During more than thirty years Prof. Coffin was engaged in collecting from all quarters, either in printed documents, or by an extensive correspondence, the data necessary to determine the mean direction of the surface winds in all parts of the Northern Hemisphere, their rate of progress, their relative velocity when blowing from different points of the compass, and the modifications they undergo in all these respects in the various seasons of the year. He succeeded in obtaining data from over 600 stations on land, and numerous observations at sea, extending from the equator to 83° of north latitude, and representing in the aggregate over 2800 years. All these series were submitted to close computations, implying an amount of work of which only those who have tried it can form an adequate idea. The results of these laborious investigations were first announced by Prof. Coffin in a preliminary paper read in 1848, at a meeting of the Association for the Advancement of Science, in Philadelphia, but were more fully developed in his work on the "Winds of the Northern Hemisphere," published in the Smithsonian Contributions to Knowledge in 1852. In this work are given, in over 150 pages of tables, the results of his computations, together with his deductions from these data, illustrated by charts and numerous diagrams.

His conclusions are of great scientific importance. It had been observed before, in a general way, that the prevailing direction of the winds, in the middle latitudes, was from the west and southwest, both in the United States and in Europe; but to Prof. Coffin belongs the merit of having first established that fact on a broad and solid foundation, by a careful discussion of the extensive array of observations which he has collected. He was the first again to demonstrate the prevalence of north and northeasterly winds beyond the Arctic circle. He thus distin-

guishes in the Northern Hemisphere three great zones of winds. 1st. The region of the easterly or trade-winds, the northern limit of which passes in America through the parallel of 32° of latitude and thence along a slanting line to that of 42° in Europe. 2d. Further north, the region of the westerly winds, the belt of the return-trades which in America terminates with 56°, and in Europe and Asia with 66° north latitude, having thus an average width of 24°. 3d. The Polar belt with prevailing north and northeasterly winds, situated mostly within the Arctic circle. The pole of these three zones, which Prof. Coffin calls the meteorological pole, does not coincide with the geographical pole, but is situated about in latitude 84° north, and longitude 105° west of Greenwich.

It is obvious, however, that the slanting direction of the middle zone follows closely the course of the isothermal lines, and is doubtless due to the general causes which increase the temperature of the continent of Europe beyond the average due to its latitude. The views presented by Prof. Coffin on the general circulation of the winds in the Northern Hemisphere, in explanation of these three zones of wind, are in close accordance with the theoretical views which have been derived from the combined action of the difference of temperature between the polar and equatorial regions, and of the earth's rotation.

No doubt the last word has not yet been said about the circulation of the general currents of the atmosphere. The movements of the upper currents have to be better ascertained. Numerous barometric observations, especially on the limits of the zone above defined, have to teach us where accumulations or deficiencies exist in the mass of the atmosphere, before we can fully understand the everlasting circuits of the winds. The mighty influence of the continental masses, according to their extent, their individual geographical forms and their relative situation, has to be studied more closely before we can fully understand the highways and currents by which the exchange of polar and equatorial air actually takes place. But Prof. Coffin has furnished a new base for further investigations and progress in this complex science of the most unmanageable of the terrestrial elements.

His tables and maps show also plainly the modifications caused by the seasons in the course of the general winds. The monsoon winds, due to the difference of temperature of the continents and

oceans, which varies with the power of the insolation, can be followed with ease both in America and Europe.

No one was more aware than himself that a larger number of facts, observed at stations more widely and uniformly spread, were needed to give a still broader foundation for the laws he had established and to perfect their expression. He did not consider his work finished by the publication of his first essay. For a score of years he continued to gather, with increased ardor, all the information to which he could have access. With this end in view, he accepted the immense labor entrusted to him by our venerable President, the Secretary of the Smithsonian Institution, of reducing and discussing the observations collected by over 800 observers, under the Smithsonian Meteorological System, and those furnished by the army from 1854 to 1859. This work was performed with his usual skill and faithfulness, and with a disinterestedness only too rare, and the results were published in a large quarto volume of over 1200 pages. All the material contained in the transactions of scientific societies of the Old World were placed at his disposal by the Secretary of the Smithsonian Institution, and diligently made use of by him. He was thus enabled to extend his investigations to the winds of the whole globe, and he read a first paper on the Wind System of the Southern Hemisphere before the American Association for the Advancement of Science in 1859. Before the same society he also read, as early as 1853, a valuable paper on "An Investigation of the Storm Curve," deduced from the relation existing between the direction of the wind and the rise and fall of the barometer." A subject which he was preparing to treat more fully before the Academy, at the time of his death.

But when our lamented colleague was ready to sum up the last results to which he had arrived, he was, in the Providence of God, called away from the scene of his earthly labors. His work, however, being in a sufficient state of forwardness to be completed by his assistants and other aid, it is hoped that it will soon be published under the auspices of the Smithsonian Institution.

The value of Prof. Coffin's investigations could not fail to be recognized. His work won for him at home and abroad, especially in England and in Germany, the well-deserved fame of a careful and reliable meteorologist, and of a discoverer of new truths in his favorite branch of study.

I have only spoken thus far of the man of mind, of the successful investigator of nature. This was the theme that I had to treat before you. This, however, is but one part, and not the most exalted of the noble character of our departed colleague. Intelligence, that powerful instrument for acquiring knowledge; for reading God's wisdom in the great book of the universe, is not *all* of man. His deeper nature aspires higher than this finite world revealed to us by the senses, and the measure of his moral excellence is given by the degree of intimacy he holds with the heavenly Source of all perfection.

Permit me, therefore, to add a few words on Prof. Coffin's moral nature, on those qualities of character, which, in all men, constitute the real individual, whom we love or hate, esteem or despise. This task, indeed, is a pleasant one, for it does the soul good to contemplate such an assemblage of genuine virtues as we find in our friend and late fellow laborer.

Naturally modest, unobtrusive, and absolutely unselfish, he never sought to impose himself or his opinions on others. His kindness of heart, his gentleness, coupled with great firmness, energy, and perseverance, exerted, however, a strong and beneficent influence on his surroundings. His profound love of truth made him the cautious, candid, and persevering observer whom we know, while his inquiring mind kept his eye open to every ray of light, from whatever quarter it might come. He was conscientious to a fault in the performance of even the most trifling duties. The same upright honesty which guided him in his scientific inquiries, he also applied to the earnest research for the solid foundation of his religious life.

At an early age he passed through that ordeal of self-examination, which prepares our deliberate and conscious acceptance of the truths taught us during our younger days, and soon sailed from the troubled waters of uncertainty into the harbor of peace, where he found rest and joy.

The blessed consequences were apparent in his moral purity, his sincere love for his fellow-men, which won him the esteem and love of all. His devout spirit and consistent Christian life secured for him a still higher reward: the approbation of the Father and Master of us all, whom he so sincerely loved, and so faithfully tried to serve.