MEMOIR

OF

JULIUS ERASMUS HILGARD.

1825-1890.

BY

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Julius Erasmus Hilgard was born on January 7, 1825, at Zweibrücken, Rhenish Bavaria, where his father, Theodore Erasmus, held for a number of years the position of chief justice of the court of appeals (supreme court) of that province of Bavaria. Born in the initial year of the French revolution and educated under the influence of that remarkable period, the father was a prominent Liberal in the most liberal province of Germany, and, chafing under the reactionary tendencies and measures that had become especially rampant after the futile attempt to overthrow them, made by some of the hot-headed youth at Frankfort-on-the-Main in 1833, he conceived the purpose of transplanting his large family to the United States, where he hoped to find the "ideal republic" realized. Despite brilliant offers of advancement from the government, he carried out this purpose in the autumn of 1835, accompanied by numerous testimonials of regret and esteem from his constituents, and carrying a letter from General Lafayette commending him to the good offices of the American people.

At that time the subject of this sketch had nearly completed his tenth year and had gone through the third grade of the gymnasium with so much credit that at the closing of the school course preceding his departure he carried off all the prizes—three in number—which were bestowed upon him by the noted educator, Thiersch, according to custom, amid sound of trumpets.

On the voyage from his home at Zweibrücken to the port of Hâvre, which was made by the only mode of conveyance then known; viz., by wagons, Julius, as the oldest brother among nine children, was first called upon to exercise those practical qualities that served him so well in after life. Landing at New Orleans on Christmas day, after a long passage of 62 days, the family proceeded up the Mississippi, which was running with heavy ice, to St. Louis, and thence to Belleville, Illinois, where the father purchased a farm already well developed, which remained the family residence for many years.

Schools at that time were few and primitive in that region; hence Julius, together with his brothers and sisters, received instruction from the father, the older ones also teaching the younger; all, however, with many interruptions from participation in the work of farm and household, inevitable in pioneer life. Of this Julius naturally had his full share, but he varied the routine by devoting himself successively to the study of music, of chemistry and other branches of natural science, while pursuing with his father, by preference, that of ancient and modern languages and mathematics. In the latter he soon outstripped his teacher, and thereafter continued it into the higher branches without outside help, until, in 1843, at the age of 18 years, he went to Philadelphia (where a married sister, Mrs. Sharon Tyndale,* then resided) with a view to the study of engineering and practical employment.

At Philadelphia he soon formed the acquaintance of several prominent families, among them those of Judges Patterson and Kane. At the house of the latter he was first introduced to Professor Bache, who had not long before succeeded Hassler in the superintendency of the United States Coast Survey and was a friend of Hilgard's maternal uncle, August Ritter von Pauli, of Munich, a distinguished engineer.

Another outcome of this connection was a lifelong friendship with Elisha Kent Kane, one of the sons of the family, whose subsequent explorations in the Arctic regions enlisted his hearty sympathy and support.

His first practical employment was in the preliminary surveys of the Bear Mountain railroad, then a new enterprise, but his mental activity in a higher sphere soon manifested itself in a communication to Mr. Bache, made in January, 1844, in which he called attention to errors in the formulas used in the Coast Survey in the computation of geographical positions, and gave his own development of correct formulas. In reply Mr. Bache wrote to the young man of nineteen: "You have overridden two of our most experienced computers and have shown that they are seriously in error." The incident was soon followed up by Bache with an offer of subordinate position in the Coast Survey, in accepting which young Hilgard remarked that he would rather "do high work at low pay than low work at high pay." He entered at once upon the work

*Sharon Tyndale was later on secretary of the State of Illinois.

assigned him in the computing division, but his official appointment bears the date of December 28, 1846. In the year 1845–'46, however, we already find him engaged in the secondary triangulation of the Chesapeake, below Kent island, the illness of the chief of the party, Captain (since General, C. S. A.) Joseph E. Johnston, left Hilgard in charge of the work. Concerning this first trial of his strength the superintendent's report of that year says: "The measurement of the angles was made by Mr. J. E. Hilgard, whose zeal and the ability with which he has discharged these duties deserve notice here, as they have received it in the reports of the chief of his party."

Among the field-work of the following year was the measurement of the Dauphin island base, made by Superintendent Bache, assisted by Hilgard. The latter then executed the secondary triangulation from Dauphin island to Vermillion bay, amid great difficulties arising from want of suitable means of transportation, and continuing the work late in the season "under conditions of considerable hardship that might have excused him from keeping the field."

The succeeding year (1847–'48) he extended the secondary triangulation of Mississippi sound westward to Lake Borgne, and made observations for latitude and longitude at Dollar point, Galveston bay, including chronometer difference with Pascagoula station. In conjunction with Messrs. Fauntleroy and Davidson, he commenced the measurement of base and main triangulation of Galveston bay.

During all this time, when not in the field he was engaged in computations and investigations at the office, largely under the immediate direction of the superintendent.

In August, 1848, he was married at Washington to Miss Katherine Clements, of that city.

During 1848–'49 he was chiefly occupied in astronomical, magnetic, and latitude observations on the Florida Keys, as well as measurements of a preliminary base and triangulation near Key West and Bahia Monda, and from Key Biscayne towards Carysfoot reef. Again his work was carried on far into the winter season under adverse conditions, and in December and January, 1849–'50, we find him engaged in geodetic and magnetic observations at and off Cape Florida. After some summer field-work on the coast of New England, he returned in September to take charge of the com-

puting department of the Coast Survey office, in which he continued through the years 1851–'52–'53. The efficient condition of that department during that time is specially referred to by the assistants in charge of the office, Captain Benham and Major Stevens, the latter saying: "It affords me unusual gratification to acknowledge the services of Mr. Hilgard, in charge of the computing department, and to commend the zeal, promptitude, and accuracy of every member of that department."

After 1853, while still continuing to have the supervision of the computing department, he was frequently detailed for work of special importance or difficulty, such as the measurement of bases, the testing and discussion of the errors of instruments, etc. On the 31st of March, 1854, while engaged in work on the Dauphin island base, the schooner Phœnix, with the entire party on board, was capsized in a squall and sunk to the topmast, on which the party took refuge, afterward escaping in a boat at considerable peril of their lives. Among his work of this year was the perfecting of a reflecting signal vane revolved by the wind, very simple and effective, and extensively used since.

In 1855, while still continuing occasional field-work, he was put in charge of the publication of the records and results of the Coast Survey, in order to insure a steady progress in publication. This, together with miscellaneous field and scientific work, including a series of very elaborate experiments on the comparison of the standard bar of the base apparatus with the standard meter, occupied his time very closely up to the middle of the year 1860, when the necessary attention to his material interests led him to dissolve his official connection with the Coast Survey for a time, in order to engage in a prominent business enterprise at Paterson, New Jersey.

He found himself, however, unable to relinquish his interest in the affairs of his "first love," the Coast Survey, and when, at the outbreak of the civil war, Superintendent Bache appealed to him to return and lend his aid in supporting the Survey, when its very existence was threatened as a measure of ill-understood economy, he promptly dissolved his lucrative business connection and repaired to Washington, where he brought strong arguments to bear upon Schuyler Colfax and Roscoe Conkling (eminent as leaders in the dominant party), showing how important such an organization as the Coast Survey must be to the country in time of war. At first, Conkling's close and critical examination of his argument led Hil-

gard to believe him actuated by a spirit hostile to the Survey; but he was greatly relieved to find, soon afterward, that he had converted both men into earnest and active supporters of the work. Subsequently he took an active part in organizing the National Academy of Sciences, of which he became a charter member; he also contributed largely to the investigations made by that body for the Government.

In 1862 he assumed charge of the Coast Survey office, a position which during the war involved heavy responsibilities, which were soon aggravated by the beginning of the mental disease that incapacitated Mr. Bache for performance of the duties of Superintendent, and terminated in his death. Gradually Hilgard found himself forced to assume, one after another, the duties of Superintendent, until in the autumn of 1864 the whole devolved upon him, in addition to his duties as assistant in charge of the office. In this onerous and responsible position he remained, under heavy strain, until, in February, 1867, the appointment of Benjamin Peirce as Superintendent terminated the interregnum. All these extra services were rendered by him without compensation.

Of the political causes which brought about Hilgard's being passed over in the appointment of a successor to Bache it would be profitless to speak here. As the one who had carried the burden of the work during the most critical period, and had not only brought it through safely, but with increased reputation and appreciation for efficiency and usefulness, his claims were too obvious to be overlooked or fairly contested. As to his action under the slight, it is pertinent to introduce the following testimony of Superintendent Peirce, a competent witness, who cannot be suspected of partiality:

"During the illness of my lamented predecessor the administration of the Survey fell upon the shoulders of the assistant in charge, Mr. J. E. Hilgard. The distinguished ability with which this difficult service was discharged was manifest to all. He has extended to me the benefit of this experience liberally and loyally. While I willingly acknowledge myself under deep and lasting obligations to him for the aid thus rendered me, I can also testify that in all respects he has been equally true to my predecessor, the greatness of whose reputation has not been diminished in his keeping."

That, with such a record and with such testimony in his favor, his claims should have been passed over a second time in the appoint-

ment of the successor of Peirce, on the resignation of the latter, was not unexpected, in view of the continuation in power of the same dominant influences; that the event should have passed without exciting some painful reflections with him and others cognizant of the facts would have been unnatural. It was partly, doubtless, under the influence of a feeling that reparation was due that Hilgard was elected to the presidency of the American Association for the Advancement of Science for the year 1875.

He, however, continued in charge of the Coast Survey office and in the performance of a great variety of scientific work until his appointment to the superintendency in 1881. The duty of conducting the work of the office of Weights and Measures also devolved upon him as assistant superintendent during that time, and he was essentially active in shaping the legislation concerning the legalization of the metric system in the United States. The metric standards for the States were prepared under his supervision.

In April, 1872, he departed for Europe in charge of operations for the telegraphic determination of transatlantic longitude, specially between the observatories of Greenwich and Paris on the one hand, and those of Harvard and Washington on the other. The successful accomplishment of this long-pending task by himself as an American was a source of much gratification to him.

He returned to his duties at the Coast Survey office in November, 1872, and in the course of that year made a special determination of the length of the standard bar used in the measurement of the primary base line near Atlanta, Ga. The following year he continued the same duties until September, 1874, when he departed for Europe a second time, under an appointment as a delegate to represent the Government at the International Conference for the construction of a new standard meter, which had been called at Paris. The report of the Superintendent says on this subject:

"To the watchful care of Professor Hilgard for the interest of the public service and his intimate relations with leading scientific men at home and abroad is mainly due the present standing of the office. As a member of the International Committee on Weights and Measures, to which body he has been accredited by the President of the United States, Mr. Hilgard, as vice-president of the commission, will take passage for Europe before the close of the present month to attend a meeting of the body at Paris."

He participated actively in its deliberations with such ability that when it had been determined to establish an International Bureau of Weights and Measures at Paris, the directorship of the new institution was offered to him, but was declined, to the surprise and regret of many of his friends who were familiar with the aspect of affairs at Washington, and who would have desired for him the *otium cum dignitate* of such a position.

In a subsequent report, the Superintendent of the Coast Survey says, regarding this offer: "The invitation tendered to Assistant Hilgard to accept the directorship of the bureau marks the sense held in that eminently scientific body of this special fitness for organizing and conducting an institution so exacting in its scientific demands and so novel in political inception. While declining the proffered honor, he will nevertheless continue his coöperation as a member of the International Committee on Weights and Measures."

Subsequently a beautiful Sèvres china vase was presented to him on behalf of the French Government by President Thiers, in recognition of his services in connection with the International Commission, a similar one being presented to Professor Joseph Henry.

In the report of 1874–'75, the Superintendent remarks in respect to Hilgard's relations to the Survey: "To his long experience, eminent ability, and thorough comprehension of the requirements of the work, is due the effective coöperation of the office work with that in the field."

In the report of the following year we find a paper from his pen, on a chart of the magnetic declination of the United States.

In 1875 he wrote a paper for the American Association for the Advancement of Science "On the Measurement of a Base Line for the Primary Triangulation of the United States Coast Survey near Atlanta, Georgia;" another for the Philosophical Society of Washington on "The Relation of the Legal Standards of Measure of the United States to those of Great Britain and France." In August, 1876, he also delivered an address as retiring president of the American Association for the Advancement of Science.

During the following year, while continuing in charge of the office, he was appointed Inspector of Standard Weights and Measures, sets of which had been ordered to be distributed to the several states. He also made a comparison of the American and English standard yards, a matter of great importance and interest. He

likewise described an optical densimeter for sea water,* and made important instrumental comparisons. The report of the Superintendent for 1876–'77 says:

"In the summer of 1876, but without remitting in executive duties pertaining to the Coast Survey office, Mr. Hilgard acted as one of the judges on scientific and mechanical apparatus at the Centennial Exposition at Philadelphia. His intimate knowledge respecting instruments of precision associated him, as a leading member of the board of judges, with some of the ablest scientists of America and Europe.

"Subsequently, on invitation, he delivered a course of 20 lectures for the Johns Hopkins University at Baltimore, on the subject of 'Extended Territorial Surveying,' thus contributing the benefit of his long experience to the training of young men for a branch of work which is one of the great needs of the country—an accurate mapping of its entire surface."

In June, 1878, he was detailed from his office-work for important duties requiring the presence of a representative of the Coast Survey in Europe. He assisted in organizing an International Committee on Weights and Measures; made at London a comparison of the Coast Survey standard yard with the British Imperial standard, and also attended the annual session of the International Geodetic Association at Hamburg.

On his return from Europe, in November, 1878, he resumed charge of the office, directing many scientific investigations and, among others, selecting points for magnetic observations in the United States from and in addition to those at which observations had for a number of years been made at the charge of the "Bache fund" under his direction. He made records and reports of these observations to the National Academy of Sciences in 1881.

In December of that year, on the death of Superintendent Patterson, he was himself appointed to the office and continued in the same until, in July, 1885, he was obliged to resign. Among the special work done by him during that period was the construction of a relief model of the basin of the Gulf of Mexico (for which he suggested the name of the "Bay of North America"), and the publication of a memoir on the same, published in the *American Journal of Science.*

*For this instrument a gold medal was subsequently awarded to him at the London International Fisheries Exposition, 1883.

It is certain that at the time of his appointment to the superintendency his physical and mental strength had already become seriously impaired by the inroads of the insidious disease (Bright's) which ultimately, after several years of often intense suffering, ended in his death. That to some extent he was conscious of his enfeebled condition is evidenced by his remark when receiving the notice of his appointment, that "it came too late." Years before his life had been saddened by the loss of three young children; it was now darkened by the death of the last remaining son, Frederic, who, though always delicate, had lived to manhood and appeared to be entering upon a successful career as civil engineer. This blow, coming at a time when even in his letters he complained of increasing inability to do the accustomed amount of work, gave a grave downward impulse to his already failing strength. That he did not at that time find any one to lean upon as Bache had leaned upon him under similar circumstances was a misfortune which allowed matters to progress until a political change found in his case a welcome opportunity for the exhibition of the reformer's zeal. In respect to his physical and consequent mental condition at the time when he appeared before the Presidential commission on the conduct of the Coast Survey, it may suffice to say that the physician who examined him immediately after his resignation declared that had he been aware of the facts he "would, unsolicited and from a sense of justice, have gone before that body and testified that Hilgard could not be held responsible for his acts." This statement, amply corroborated by the severe illness immediately following, should dispose of the unjust censure visited upon him at the time, whether by those ignorant or by others forgetful of the devotion, singleness of purpose, and high ability which had uniformly marked his previous career. While there could be no question of the necessity for a change, the difficulty long experienced by the administration in finding a successor among his peers in science stands in evidence of the feeling excited in them by the harshness of the treatment bestowed upon him.

In his personal and social relations, Hilgard was early noted for his geniality, an intense appreciation of the beautiful in art and literature, and a thorough enjoyment of the humorous, however grave might be the situation that gave rise to it. He remained through life very fond of the ancient classics. A small pocket edition volume of Horace's odes long accompanied him on his travels, and he

was fond of quoting for his own and others' benefit on critical occasons the "Æquam memento rebus in arduis servare mentem," a principle he honored by close observance so long as he remained of sound mind. Perhaps none of his personal traits was more pronounced than his generosity toward those in need, whether of substantial aid (which was frequently given beyond his financial ability) or of advice and moral support. To deserving young men especially he liked to extend a helping hand, and tired not of doing so, even though too often illy rewarded for his efforts. He often said that the older men ought to see to it that the right kind of successors were ready to fill their places when they left the stage. The loyal friendship he bore toward others he trusted would be reciprocally extended, and he seemingly preferred the disappointment thus frequently incurred to a relinquishment of his faith in human nature at large. That the life of a mind so constituted should be largely checkered with disappointment was inevitable; but to such lives the unswervingly faithful performance of duty, the singleness of high purpose, and the accomplishment of the same, so far as circumstances permit, carry their own reward.

He died at his residence in Washington, after a lingering and painful illness, on May 9, 1890.