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Davidson, George. Memoir.

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AMERICAN SOCIETY OF CIVIL ENGINEERS

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MEMOIRS

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GEORGE DAVIDSON, Hon. M. Am. Soc. C. E.¹

DIED DECEMBER 1, 1911

George Davidson was born at Nottingham, England, on May 9, 1825. He came to the United States with his parents in 1832, and his early education was obtained in the Central High School, at Philadelphia, Pa. He was employed as Magnetic Observer at Girard College, in Philadelphia, from 1843 to 1845, and on June 1, 1845, he entered the service of the United States Coast and Geodetic Survey, as a Computer and Secretary to Superintendent Bache. He was appointed an Aid in 1846, and during the last twenty-seven years of his service was in charge of all Coast Survey operations on the Pacific Coast of the United States, until his resignation on June 30, 1895.

From 1846 to 1848, while serving as an Aid, Mr. Davidson was a member of survey parties engaged in making astronomical and meteorological observations, and, from that time, his interest in astronomy never flagged.

The necessity for an accurate knowledge of the Pacific Coast in the interests of navigation was recognized by the Federal authorities in Washington, D. C., and, in the summer of 1850, Mr. Davidson was appointed Chief of a party for making the needed surveys. The first requirements were the determination of the geographical positions of the prominent capes and headlands, the hydrographic surveys of the principal harbors, and the topographic surveys of the shore line adjacent to the harbors. Mr. Davidson's first observing station on the Pacific Coast was at Point Conception, California, one of the most prominent and dangerous on the coast. Here, he determined the latitude and longitude of the station, the variation and dip of the magnetic needle, and also reported on the best location for a lighthouse in that neighborhood. During the next four years, stations were occupied in California, successively, at Monterey, San Diego, Cape Disappointment, Port Orford, Neah Bay, the Presidio of San Francisco, and at approximately twenty minor points.

¹ Memoir prepared by Fremont Morse, Esq., Berkeley, Calif., and presented by Paul C. Whitney, M. Am. Soc. C. E.

At that time only two methods were available for obtaining longitude, one by moon culminations and the other by the observed times of occultations of stars by the moon. Both these methods were used by Mr. Davidson. Travel along the coast in those days was by sailing vessels, and dangerous landings through the surf were often unavoidable. Sometimes there was danger from hostile natives, as at Neah Bay, where the observations were made behind breastworks, with men fully armed and ready to shoot.

A report by Mr. Davidson, entitled "Directory for the Pacific Coast", giving the results of his accumulated observations, was issued in 1855 as a guide to mariners. In the Coast Survey report for 1858, the Superintendent refers to this Directory as follows:

"This useful work has been compiled by George Davidson, Assistant in the Coast Survey, from Coast Survey and other authentic data, embodying also the results of his own experience on the coast, and topographical parties since the commencement of the survey in 1850. Having thoroughly and peculiarly identified himself with the survey of the western coast from its beginning, and having occasion himself to know the necessities, facilities and dangers of its navigation, he has been in a position to prepare a particularly valuable directory for the use of mariners and navigators."

This Directory was later known as the "Coast Pilot of California, Oregon, and Washington," and has passed through many revised editions.

Early in 1867, Mr. Davidson was appointed as Engineer of the exploration party dispatched by the Government to the Isthmus of Darien for the purpose of finding a practicable location for an Isthmian Canal. Immediately following the purchase of Alaska from Russia, he was ordered to make a preliminary geographical survey of that Territory, and, in 1868, the results of these accumulated observations were published in the "Coast Pilot of Alaska", of which he was the author.

The partial eclipse of May 26, 1854, was observed by Mr. Davidson at Humboldt Bay, California, chiefly for times of contact of solar and lunar images. He observed the occultations of twenty-two stars of the Pleiades group on March 1, 1857, and, to strengthen the longitude determination of the San Francisco Station, he observed at San Francisco the partial solar eclipse of March 25, 1857. He observed occultations of the Pleiades on March 25, 1860, at Ross Mountain, and the partial solar eclipse of July 18, 1860, on Sonoma Mountain.

Because of his intensive work on the astronomical foundation of the Pacific Coast surveys, any weak point in the instruments used was brought to his attention, and many improvements were suggested because of his inventive genius. A description of his meridian instrument for determining time, longitude, and latitude, which is used extensively by the Survey throughout the United States, was published in the report for 1867.

The construction of the Union and Central Pacific Railways, and the establishment of telegraphic connection between the Atlantic and Pacific Coasts enabled the longitudinal determinations of the West Coast to be placed on an accurate basis for the first time. The Pacific end of the longitudinal comparison with Harvard College Observatory was conducted by Mr. Davidson

in a temporary observatory set up for the purpose in Washington Square, San Francisco. Telegraphic signals were exchanged with Cambridge, Mass., on twelve nights between February 15 and April 4, 1869, through the courtesy of the Western Union Telegraph Company. Mr. Davidson had already taken part in the transatlantic longitudinal determination in 1866, conducted by means of the new Atlantic cable.

The total solar eclipse of August 7, 1869, was observed by Mr. Davidson on the Chilkat River, Alaska, and, in 1870, he recorded the flight of 556 meteors at the San Buena Ventura Station, and made a special report on the subject.

In 1873, his party surveyed and permanently marked the eastern boundary line of California, north of Lake Tahoe, fixing the position of the 120th meridian west of Greenwich, and from 1893 to 1899, the diagonal boundary line from Lake Tahoe southeasterly to the Colorado River, was run.

The transit of Venus had been observed in 1769 by M. Chappe de l'Aueroche, at San José del Cabo, in Lower California, but this observer had not determined, or at least had not published, the exact position of his observing station. On account of the interest attached to the transits of Venus which occurred in 1874 and 1882, Mr. Davidson, in 1873, searched for the exact spot occupied by de l'Aueroche. Although no evidence of the latter's occupation remained, the description of the station enabled Mr. Davidson to locate it within a space of 20 sq. ft., and the co-ordinates of the observing station were accordingly determined.

Mr. Davidson was appointed by the United States Government Commission to observe the transit of Venus, in Japan, on December 8, 1874. On that occasion he determined the difference of longitude between Nagasaki and Tokyo, telegraphically, at his own expense.

He was a Delegate from the Federal Government to the Paris Exposition of 1878, with instructions to examine and report upon the instruments applicable to geodesy and astronomy. He was elected President of the Jury on Machinery by the French and foreign jurors. This Jury examined 3 800 pieces of machinery and awarded 850 prizes. Mr. Davidson was awarded a diploma and a medal for this service by the French Government.

The total solar eclipse of January 11, 1880, was carefully observed from the summit of Santa Lucia Mountain, California, by a Coast Survey party under his direction. He also directed the United States Government party for the observations of the transit of Venus, at Cerro Roblero, New Mexico, in 1882.

In the late Eighties, the question of the variation of terrestrial latitudes was prominent, and observations at widely separated stations were urgently requested. Mr. Davidson undertook the observation of latitude pairs, by the Tallcot-Horrebow method, at his observatory in San Francisco, between May, 1891, and August, 1893. An additional series was made by him in 1893 and 1894. The results confirmed those secured at European, Atlantic Coast, and Hawaiian stations, establishing the fact that the astronomical latitudes of points on the surface of the earth are constantly changing by minute amounts.

Mr. Davidson's programs of observation, whether for the determination of latitude, time, azimuth, magnetic declination and dip, refraction constants, or for research in theoretical astronomy on his own account, were characterized by the great number of observations planned for and acquired as well as by the observance of precautions for ensuring that the individual observations be as accurate as possible.

It is a remarkable fact that the first investigating astronomical observatory planned for the western half of the United States—the Lick Observatory—was on a large scale for its time. The first research observatory completed, however, was that of Mr. Davidson. This was established in Lafayette Park, San Francisco, about 1879. It contained a 6.4-in. equatorial telescope (by Mr. Alvan Clark) and auxiliary apparatus. Here, Mr. Davidson made drawings of the principal planets and observed star occultations and comets. The instruments were transported to stations occupied for the various eclipse observations.

Mr. Davidson was one of the three Commissioners sent by the United States Government in 1875 to East Asia, India, Egypt, and Europe, to report on the methods and state of irrigation in those countries. He was also a delegate from the United States to the Conference of the International Geodetic Association held in Paris, France, in 1889, and was commissioned to bring to Washington the international prototypes of the standard meter and kilogramme.

His life was devoted with untiring energy and complete unselfishness to the interests of science on the Pacific Coast. It is no exaggeration to say that during sixty years his name was more familiar to the scientifically inclined of that region than that of any other resident. His services were not confined to the requirements of the Coast Survey work, and his efficient help was always available for the advancement of any department of science.

Professor Davidson was an authority on the voyages of the early explorers of the Pacific Coast and on its early history. The subject of astronomy, theoretical and practical, seemed to make a special appeal to him. He was well versed in the geodetic applications of astronomy, and the reports of the Coast Survey show that he never failed to grasp opportunities for making observations promising to be useful in any department of theoretical astronomy. The list of his published contributions contains many titles relating to eclipses, occultations, meteors, comets, and to atmospheric conditions affecting astronomical observations. His influence with James Lick, while Mr. Lick was formulating plans for erecting the most powerful telescope in existence, was wise and potent, and perhaps even vital to a practical solution of Mr. Lick's problem. In fact, it is entirely possible that without Professor Davidson's guidance at a critical period the plans for the construction of a useful telescope and observatory might have come to grief.

He was President of the California Academy of Sciences for sixteen years, and of the Pacific Geographical Society for thirty years. At various times and during periods of different length, he served on the Federal Commission for Irrigation, in California, the United States Advisory Harbor Commission

of San Francisco, the Mississippi River Commission, and the United States Assay Commission, as Regent of the University of California, and, during the last ten years of his life, as Professor of Geography in the University of California.

The high merit of Professor Davidson's work was recognized by the conferring of honorary degrees and election to membership in many learned societies. He received the degree of Master of Arts from the Central High School of Philadelphia, in 1850; the honorary degree of Doctor of Philosophy from Santa Clara College, California, in 1876; the honorary degree of Doctor of Sciences from the University of Pennsylvania, in 1889; and the degree of Doctor of Laws from the University of California, in 1910. He was made a Life Member of the Academy of Natural Science of Philadelphia, in 1885. He was elected a member of the American Philosophical Society in 1886; a member of the National Academy of Sciences in 1874; a Fellow of the American Association for the Advancement of Science in 1880; an Associate Member of the American Academy of Arts and Sciences in 1887; a Corresponding Member of the Bureau of Longitude of France in 1894; and a Foreign Correspondent of the Academy of Sciences of France in 1901. He held Honorary Membership in the American Geographical Society, of New York, the Royal Geographical Society of London; the Swedish Society of Anthropology and Geography; and the Berlin Geographical Society. He was a member of the Seismological Society of America (President, in 1907), the California Academy of Sciences, the Pacific Geographical Society, and the Washington Academy of Sciences. He was created a Knight of the Royal Order of St. Olaf of Norway in 1907, and he received the Charles P. Daly Medal of the American Geographical Society in 1898.

On October 8, 1858, he was married to Elinor Fauntleroy, of Virginia, and made his home in San Francisco until his death on December 1, 1911. He is survived by a son, Thomas Davidson, and a daughter, Elinor Davidson, both of San Francisco.

Fremont Morse, Hydrographic and Geodetic Engineer (*Retired*), U. S. Coast and Geodetic Survey, one of the few officers still living (1931), who served with Professor Davidson, writes of him as follows:

"He was a man of strong likes and dislikes. As a chief of party, he was the finest I have ever served under. If he had confidence in you and knew you could handle any situation that might arise, he would never give you any detailed instructions when assigning you to perform a piece of work; but if at any time you felt you needed some help, he was never too busy to interrupt anything he might have in hand and would willingly give you the benefit of his great experience."

Professor Davidson was elected an Honorary Member of the American Society of Civil Engineers on May 5, 1897.