MEMOIR

OF

AMOS HENRY WORTHEN.

1813-1888.

BY

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READ BEFORE THE NATIONAL ACADEMY, NOVEMBER, 1893.

BIOGRAPHICAL MEMOIR OF AMOS H. WORTHEN.

Mr. President and Members of the Academy:

In compliance with the requirement which I understand to be implied by my appointment to write a biographical memoir of our deceased associate, Mr. Amos H. Worthen, I have prepared a short narrative of those events and incidents of his life which reveal the characteristics of the man, together with a statement of the principal facts which relate to his scientific career. The latter I have based upon his published works and my own personal recollections, and the former upon information received from his surviving kindred.

Amos Henry Worthen was born in the town of Bradford, Orange county, Vermont, October 31, 1813. He was a son of Thomas Worthen and Susannah Adams, his wife, and the eleventh of the twelve children born to them, all of whom are now dead.

Of the father, Thomas Worthen, I have been able to learn comparatively little, but he seems to have come of a Massachusetts family, descendants of which are scattered through a number of the States of the Union. In early manhood he came with his young wife to Bradford and purchased a farm upon what was known as the South Road, a few miles westward from Bradford village, where they made their permanent home and where their children were born and reared. He was born August 24, 1765, and died October 21, 1851.

His wife Susannah was born December 24, 1768, and died March 17, 1843. She was the eldest child of Abraham Adams, a descendant of Henry Adams, who came from England and settled at Mount Wollaston (now Quincy), Massachusetts, and who was the founder in America of the celebrated Adams family that has included two Presidents of the United States. She was a woman of great energy and tact, and is remembered by her descendants as possessing a most amiable disposition. It is evident that it was largely from her that her son Amos inherited the force of character and adherence to a definite purpose which distinguished him. Between mother and son also there was not only the strong natural affection which such a relation engenders, but during the whole of their concurrent life there was the closest sympathy between them.

The childhood and early youth of Amos were spent continuously upon the farm, where he was employed during the warmer months of the year in such of its labors as were suitable to his strength, but in winter these labors were sufficiently respited to allow him to attend the district schools of the neighborhood. His well-directed labor and the sports which the surrounding fields and forests afforded resulted in the development of a vigorous physical manhood, and his winter schooling—for the Vermont district schools were among the best of their class—gave him the foundation of that mental development that afterward distinguished him. As his youth progressed and he had mastered the rudiments taught in the district schools he desired to enter Bradford Academy, since merged with the Bradford High School, which was located at the village a few miles from his home. He obtained the means to gratify his wish, and it was at this institution that young Worthen received the last of his school training.

During his attendance at Bradford Academy he boarded in the family of his sister Mary, who was older than himself and who had married Captain Ellis Bliss, an extensive farmer in the Connecticut valley. It is mainly to N. W. Bliss, Esq., of Chicago, one of the sons of this gentleman and a fellow-pupil at the Academy with his youthful uncle, that I am indebted for the larger part of these details of his earlier personal history.

While prosecuting his studies at the Academy young Worthen also prosecuted his suit for the hand of Miss Sarah B. Kimball, of Warren, New Hampshire, and they were married on January 14, 1834, at which time he was in his twenty-first year. The union was a fortunate one and lasted fifty-three years, when it was broken by the death of his faithful wife, which occurred only a little more than a year previous to his own. Seven children were born to them—one daughter and six sons. The daughter died in childhood, but all the sons still survive him.

Upon assuming his new responsibilities the young husband decided to make his home in what was then called the Far West, Ohio and Kentucky, with few exceptions, receiving the most adventurous of the emigrants from New England. Such a journey was then a serious undertaking, most of it being through a comparative wilderness and by slow means of transportation, for railroads were yet in an experimental condition and none of the few then existing was available for any portion of it. His eldest brother,

Enoch, had already removed with his family to Cynthiana, Kentucky, and thither Amos also decided to go. His stay at Cynthiana seems to have been short, for we learn that in the next year after leaving his New England home he was teaching school at Cumminsville, near Cincinnati, Ohio. He remained at Cumminsville until June, 1836, when he joined the tide of emigration which had begun to flow into the Mississippi valley, and settled at Warsaw, Illinois. Here, with the exception of an interval of two years, 1842 to 1844, which he, together with his family, spent in Charlestown, Massachusetts, he lived continuously until his death.

Some of his wife's family, the Kimballs, had preceded the young couple to Warsaw and its vicinity, and with one of her brothers Mr. Worthen formed a partnership in mercantile business. This business, with the exception of several changes and interruptions, he continued until 1855, after which time he devoted himself entirely to the scientific pursuits for which he had been preparing himself ever since his arrival in Warsaw.

It is a fact, but not a surprising one, that Mr. Worthen's career as a merchant was not successful as success is usually counted in such occupations. Business as such had no attractions for him, or none beyond the fact that it yielded him the moderate means of meeting the necessary demands of his growing family, but unconciously to his friends, who were sometimes inclined to censure him for what to them was an evident lack of business enterprise, it was giving him an opportunity to accomplish far more than this. His inherent predilection for natural science had from his boyhood been subdued or kept latent by the pressure of duties to the demands of which he was ever ready to respond, but it found at his new home and in its vicinity an unwonted and irresistible stimulation.

The forests of the Mississippi valley and the adjacent broad prairies afforded him a boundless field for study and observation, and, above all, the fossiliferous rocks of the Lower Carboniferous series, which prevail in that region and some of which are well exposed at and around his home, were his especial delight. He began at once the study of this great series of strata and the collection of its fossils and minerals. With these as a basis he soon established a system of exchanges with correspondents in the East by which he received in return such books and mineralogical and zoölogical specimens as were necessary in the prosecution of his studies.

This work was undertaken more than fifty years ago, and it is

well to refer to some of the conditions then existing which are very different from those which now exist—for example, postage on each of his letters of correspondence cost 25 cents, a not inconsiderable sum in those days, when the country was drained of its money to pay for Government lands. Because there were then no overland freight or express lines, all his exchanges were necessarily sent and received by Mississippi river steamers between Warsaw and New Orleans, and by Gulf and Atlantic sailing vessels between that city and Boston; therefore many months would often elapse before getting returns from his sendings. Moreover, an examination of the dates of publication of the books which are now indispensable in the elementary study of geology, and even of those which preceded them, will reveal the fact that none of them was then in existence, and reference to the curricula of the best American colleges then existing will show that no better instruction was available for any American student than that which this self-taught naturalist was then obtaining for himself. These are conditions the difficulties of which the younger naturalists of to-day, who have had the advantage of special training in scientific schools and who have free access to great libraries and direct communication with a multitude of scientific workers, cannot well understand.

Mr. Worthen made frequent journeys in the region traversed by the upper Mississippi river and brought together large collections of fossils; his place of business and his home became the one a storehouse and the other the workshop of a naturalist, and the result of it all was that while his knowledge increased, business languished. Still this incongruous relation was continued until about the year 1853, and it was not permanently broken until 1855, when he abandoned mercantile business and devoted himself entirely to his scientific pursuits.

In 1851 he began attendance upon the meetings of the American Association for the Advancement of Science, in which he continued his membership until his death. By this and other means he extended his acquaintance with the geologists of the whole country, so that when the time came he was able to make an intelligent selection of assistants for his public work.

At that early date he had made himself master of the general geological features of that portion of the Mississippi valley which borders upon Illinois, and when, in 1853, he was invited by Dr. J. G. Norwood, then State Geologist, to assist him in his official

work, he left his business temporarily for that purpose. This was his first public work, but its results were never published except as they were subsequently embodied in his own official reports.

In 1855 he was appointed assistant to Professor James Hall, then State Geologist of Iowa, and he continued upon that work until the close of 1857. Besides contributing two important chapters to Professor Hall's report upon the geology of that State, he aided him largely in constructing the geological section along the Mississippi river from Lansing, Iowa, to St. Louis, Missouri, which is published in that report. It was while engaged upon the construction of this section that my personal acquaintance with Mr. Worthen began, and which was continued with great gratification to myself during the remainder of his life.

On March 22, 1858, the State geological work of Illinois having previously become suspended, Governor Bissell commissioned Mr. Worthen as State Geologist, and he at once assumed the duties of that office. His previous long period of patient labor had been preparatory, but his entrance upon this public office was the beginning of a career upon the like of which he had long ardently desired to enter and which he prosecuted without interruption until his death, which did not occur until thirty years afterward.

Upon assuming the duties of his office he quickly comprehended the magnitude of the task that lay before him, and he began to gather about him men skilled in various branches of scientific work, the names of six of whom appear upon the list of either living or deceased members of this Academy. The following is a list of those who have aided him in this work and who have contributed their writings to his reports and other publications:

Bannister, H. M.
Barris, W. H.
Blaney, J. V. Z.
Bradley, F. H.
Broadhead, G. C.
Cope, E. D.
Cox, E. T.
Engelmann, Henry
Everett, Oliver
Freeman, H. C.
Green, H. A.
Lesquereux, Leo
Lindahl, Josua
Meek, F. B.
Miller, S. A.
Newberry, J. S.
Prout, H. A.
Scudder, S. H.
Shaw, James
Springer, Frank
St. John, Orestes
Ulrich, E. O.
Wachsmuth, Charles
Whitney, J. D.

From and after the time he entered upon his duties as State Geologist of Illinois, the current of his life, although extending through thirty years, was too uniform to require a material extension of this biographical notice. During all that time his labor was constant and severe, and he took few vacations beyond his attendance upon scientific meetings, but his great physical strength made him equal to his self-imposed tasks. His delight in his work and in his home were such that his share of happiness was greater than that which falls to the lot of most men, and he desired no addition to it.

Although the current of the latter part of his life was comparatively uniform, it was made so by the same energy that had before made it eventful—that is, it was the result of his persistent adherence to a settled purpose and his consummate tact in so managing the affairs of his office as to insure the continuance of his work. There might have been other opportunities of a similar kind which offered equal, if not greater, promise of success than his own, but he did not covet them. He might have extended his investigations into other fields, but he chose to confine himself mainly to the State of Illinois. He had reached the climax of his ambition so far as opportunity was concerned, and he deliberately devoted all the energies of the remainder of his life to the fulfillment of his plans, and from this purpose he never swerved.

But his continued success was not due to the absence of adverse conditions. Again and again his work was in danger of suspension by the threatened failure of the necessary appropriations by the legislature, and more than once they were so far reduced that only the most careful management averted disaster. Once, indeed, appropriations failed entirely,* but he continued his work without compensation and with such evident sincerity of purpose that they were resumed by the next legislature. One by one his volumes of reports were published and gladly accepted by the scientific world; one by one the great difficulties he encountered were overcome, and he was permitted to finish his work to the great advantage of science and the satisfaction of the most exacting economist.

* The omitted appropriation was for the years 1875 to 1877. When appropriations were resumed in the last-named year provision was made for the establishment of the Illinois State Historical Library and Natural History Museum, and Mr. Worthen became its curator as well as State Geologist.

As his work approached completion old age was coming upon him, but he retained his mental vigor, and in a great measure his accustomed good health, until his final sickness, which prostrated him suddenly and terminated in death within a few days. He died on Sunday, May 6, 1888, in the 75th year of his age, surrounded by the people who respected and honored him and among whom he had lived a full half century. *

Personally, Mr. Worthen was of manly presence and kindly, candid, and unpretentious in manner. He was impulsively generous to his friends and charitable, even to those with whom he had little sympathy, but he was uncompromising in his love of justice and scientific truth.

The only proper standard by which to judge of his scientific labors is, and must always be, his published works, the list of which follows. These are his monument and the records by which his name will be known in future years. Extended comment upon them is not necessary upon this occasion, because more than twenty years ago this Academy carefully investigated the results of his labors and decided the question of their merit in his favor by electing him to its membership. This was done when only four of the eight volumes of his official reports were published, but it is at least safe to say that his later was in no way inferior to his earlier work.

* His six sons, Fay S., George B., Thomas A., Amos H., Jr., Charles K., and John B., were the pall-bearers at their father's funeral. His body lies buried in Oakland cemetery, two miles south of his former home in Warsaw. The place of his burial is marked by a granite family monument about seven feet in height and bearing six inscription-panels. Of the two panels upon the east side of the monument one bears his wife's name and date of her birth and death, and the other bears the following inscription :

AMOS H. WORTHEN.
Oct. 31st, 1813.
May 6th, 1888.

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APPENDIX.

The foregoing list comprises all the publications of Mr. Worthen that have come to my knowledge, and it is believed to be nearly or quite complete. It is proper to say that most, if not all, of the matter contained in the publications mentioned in that list, exclusive of the eight large volumes of survey reports, is also contained in those volumes in a completed form—that is, those publications consist of material which was printed in advance of the reports, or of that which has been abstracted from those volumes after their publication. The eight large volumes and accompanying maps therefore, represent fairly the results of Mr. Worthen's life-work.

This great work embraces the geology, both structural and economic, and the palæontology of Illinois. In the geological division was accomplished the mapping, upon one comprehensive sheet and various smaller ones, of the nearly 56,000 square miles which are embraced within the boundaries of that State, in such a way as to show its geological structure and the area occupied by each formation. The geological structure is further shown by numerous measured sections, most of them showing local relations of the strata, but the principal one was constructed from exposures along the Mississippi river, which forms the whole western boundary of the State. This section shows the relation of the different formations, from the Potsdam sandstone to the Coal Measures, inclusive, for a distance of more than 600 miles.

The immense economic resources of the State are also shown in these volumes. The characteristics and outlines of its 37,000 square miles of productive coal-field are recorded. The lead region has been carefully explored and mapped, and the character of its mineral products determined. Besides this, the character of the soils of the State is described, and its resources in stone and other building material are shown to be abundant and good.

The most conspicuous portion of this great work, however, is its palæontology. This portion is so extensive and elaborate that the volumes of the Illinois survey have long been indispensable to every palæontologist in every part of the world where the palæozoic formations are studied. The fossil forms described are all well illustrated. They have been collected from all the formations, from the Potsdam Sandstone to the Upper Coal Measures, inclusive; but those of the Lower Carboniferous and the Coal Measures are especially abundant. Some indication of the extent of this palæontological work is shown by the fact that it embraces the description and illustration of 297 species of vertebrates, 1,073 species of invertebrates, and 256 species of plants. Nearly 1,500 of these species were first made known to the scientific world through the publications enumerated in the foregoing list.