AMERICAN MUSEUM OF NATURAL HISTORY

PIONEERS

OF

AMERICAN SCIENCE

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Guide Leaflet 25

American Museum of Natural History

Seventy-Seventh Street and Central Park West, New York City

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AMERICAN SCIENCE

AN ACCOUNT OF THE EXERCISES HELD

AND THE ADDRESSES DELIVERED

AT THE

AMERICAN MUSEUM OF NATURAL HISTORY

DECEMBER 29, 1900

NORTHEAST QUARTER OF FOYER

Showing five of the Marble Busts of Pioneers of American Science.

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AND THE ADDRESSES DELIVERED

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DECEMBER 29, 1906

PIONEERS OF AMERICAN SCIENCE.

Saturday, December 29, 1906, was notable in the annals of the Museum, since at 3 o'clock of that day there were held in the large auditorium the ceremonies attending the unveiling of the marble busts which have been installed in the foyer, representing ten of the men who have been foremost in the advancement of science in America. The auditorium was crowded to its full capacity with Members of the Museum and their friends and visiting scientists, and Professor H. F. Osborn, Second Vice-President of the Museum, presided in the absence, due to illness, of Mr. J. Pierpont Morgan, First Vice-President. The exercises began with the singing of the national anthem "America," after which Dr. Hermon C. Bumpus, Director of the Museum, acting for Mr. Morris K. Jesup, addressed the Trustees as follows:

"Thirty-six years ago several men of this city organized to perform three closely-related functions:

1, To establish and maintain a museum of natural history;

2, To encourage and develop the study of the natural sciences;

3, To advance the general knowledge of kindred subjects.

"Of this company, Mr. Morgan was one; a second (Mr. Choate) is he who will receive on behalf of the Honorable Board of Trustees the splendid gift that has brought this congregation of scientists together, and a third is he who for more than twenty-five years, as President, has devoted his time, his thought, his energy, his influence, his means, his health, not for the mere naked fulfilment of the terms of the Articles of Incorporation, but for the up-building of an institution that would excite civic pride, for the molding of forces that would result in educational power, for the combination of material that would develop character and for the general exploration of the secrets of Nature, be they hidden in the remote regions of Siberia, in the unknown land and waters of the North, in the ancient monuments of the South or the outcropping foundations of the continent in the West.

"To what extent the sympathetic union of these three men with other earnest workers in a common cause has been successful in the establishment and maintenance of a museum of natural history, none are better able to judge than the members of the various scientific and educational organizations,— the guests that honor the Museum by their presence

this afternoon. Many of our guests today are frequent students of the Museum's collections, frequent readers of the Museum's publications and frequent users of the Museum's library.

"But it is the effort to fulfill the terms of the second paragraph of the Articles of Incorporation — the paragraph that refers to the encouragement and development of the Study of the Natural Sciences, that provides for the aggressive invasion of the unknown and for the encouragement of those who enter the unknown for search and research — it is the effort to fulfill these terms that has characterized the administration of this institution and made it something different from a mere museum.

"The prime incentive for the pursuit of science is doubtless indiscoverably hidden among those forces that direct the growth and activities of the human body, but the strongest secondary incentive is appreciation — commendation. An institution that is pledged to the encouragement and development of the natural sciences ought certainly to appreciate and commend those who have conspicuously devoted themselves to the pursuit of science. It is in response to this feeling of obligation and with the hope that such recognition at this time might act as a helpful incentive to those attending the important scientific meetings now being held in New York, that these exercises have been arranged.

"In an adjoining hall, as we leave this auditorium, we shall find unveiled ten portraits of the pioneers of American science, the work of one of America's leading sculptors, Mr. William Couper.

"It is this series of busts that I have the honor, on behalf of Mr. Morris K. Jesup, to present to the Trustees for permanent exhibition in this Museum, and with it may I convey the desire that they may serve as a token of the donor's esteem for all who have devoted and are devoting themselves to the development of science, and also that all entering this institution may feel that the study of the natural sciences is encouraged and developed, not by immediate results alone, but also in the proper recognition of those who have unselfishly labored for its advancement."

In accepting the gift, Hon. Joseph H. Choate said in behalf of the Board of Trustees:

"As you have already heard, it is only in my accidental capacity of survivor that I have the honor of appearing here today to receive this gift. Mr. Morgan could not come, Mr. Jesup could not accept

his own gift, — he knows how much better and more delightful it is to give than to receive, — and so I stand here for a moment on behalf of my fellow trustees, to receive this splendid donation.

"If this were Mr. Jesup's only gift to the Museum, it ought to place him among the immortals. To place in our vestibule, at the entrance of these halls of science, the busts of these great pioneers and masters, to place them here so that the future generations of New York and of America may become familiar with their features would be in itself a very great and valuable gift. Ever since the foundation of this Museum thirty-seven years ago, he has been enriching and endowing it with wonderful gifts.

"Most of you are perfectly familiar with the chief of these, — the Jesup Collection of Woods, containing the wood of every tree known to be existing in North America, a perfectly unique collection which cannot anywhere be repeated; the collections that were brought by the Jesup North Pacific Expedition from the shores of British Columbia, Alaska and Asia are also unique in their way; and in the Hall of Vertebrate Palæontology a large portion of that wonderful exhibit is from his generous hands. Even now, today, he is fitting out for our benefit an expedition for the exploration of fossils in northern Egypt, and I am sure that when Professor Osborn, who is to head the expedition, returns next spring, he will come 'bearing his sheaves with him,' in the form of the fossil remains of the ancestral elephant, which he will find somewhere between the mouth of the Nile and the Nubian Desert — exactly where I cannot tell, but he, at this moment, with his prophetic vision could put his finger upon the very spot.

"This Museum, if you will notice the date, was born in the Dark Ages of the City of New York — in 1869 — when the public enemy was in possession of the city and of its treasury. It was a gloomy day for the foundation of such an institution. I believe it was about that time that one board of public officials, catching a strange ray of light for that dark time, had employed the celebrated Dr. Hawkins to prepare models of the vast fossil mammals for exhibition to the people. They gave him a house in Central Park, where he set to work on that great study. By and by, there came in another set of public officials who were as antediluvian as the fossils themselves, and they broke his models all up and sent the doctor on his way not rejoicing at all.

"We never dared in those days to hope or expect help from the

City for such an institution as this, but light soon dawned upon us, and gradually year by year the City Officials and the people of the City began to find that this was a great educational institution maintained for the benefit of the people. But it was hard struggling in those early days. Despair followed anxiety, and our Trustees knew not which way to turn. But when Mr. Jesup, twenty-six years ago, took the presidency of this body, he found that certain fossils still lingered in the Board of Trustees, and actually breathed into us the breath of life. He has kept us alive ever since, and every year this Museum has exhibited new energy and success, and more than three fourths of it is due to his generous gifts and his inspiring presence.

"He has given us something far better and grander than material assistance, liberal as he has been with that. He has given us twenty-six of the best years of his life, devoted with untiring generosity to the success of this enterprise. It is also to be remembered to the great credit of Mr. Jesup that it was during his administration that the Museun took one significant step forward, which we had long been hesitating to do — I mean the opening of the Museum to the public on Sundays. It was the best advance we ever made. We found that we could do our duty to the church in the morning and come here with equally reverent minds in the afternoon to study these collections and look through Nature up to Nature's God, and the people found that out too.

"And so with grateful hearts the Trustees accept this last and noble offering, and I am sure you will all with one voice join with me in saying — God bless the noble donor."

After Mr. Choate's address brief memorials of the men of science whose portraits have been selected for the foyer, were delivered in accordance with the following program:

Benjamin Franklin, by Dr. S. Weir Mitchell of Philadelphia;

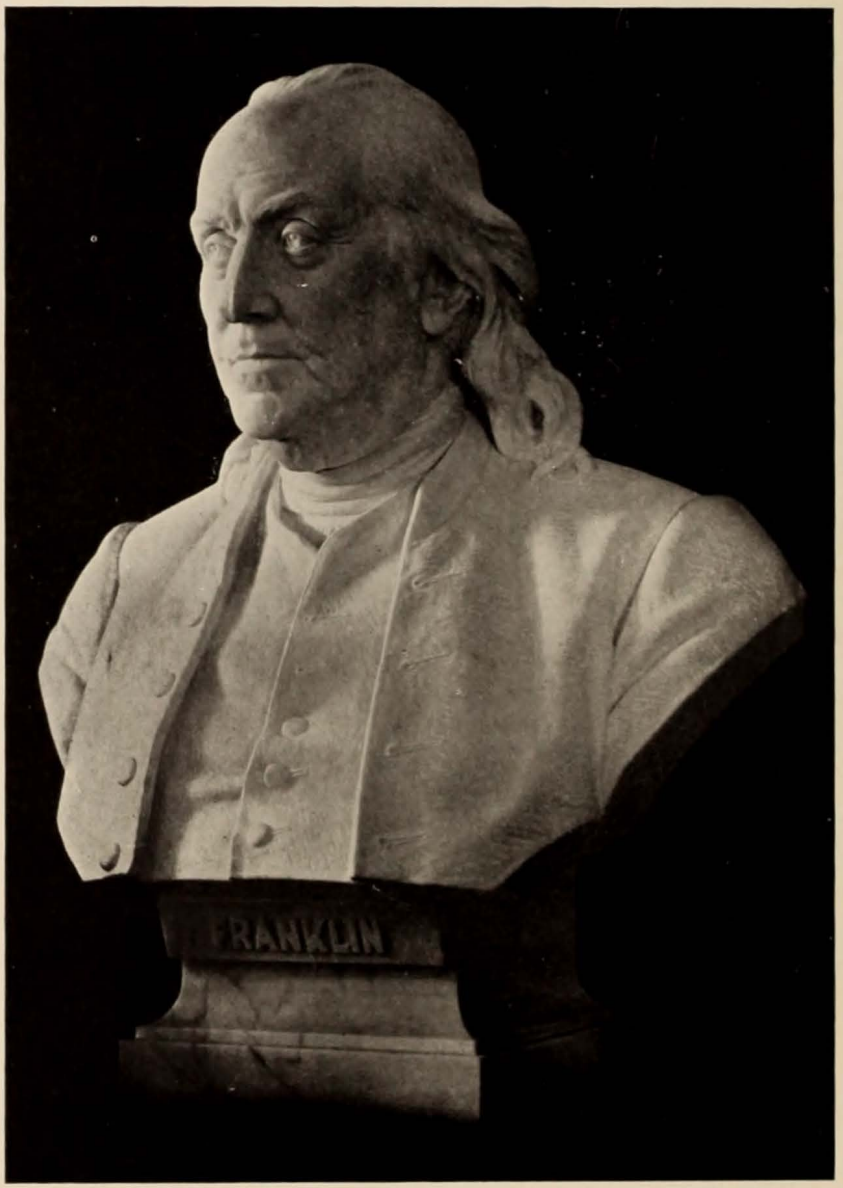
Alexander von Humboldt, by His Excellency, Baron Speck von Sternburg, German Ambassador. (Read by Major T. von Körner, Military Attaché of the Embassy);

John James Audubon, by Dr. C. Hart Merriam, Chief, U. S. Biological Survey, Washington, D. C.;

John Torrey, by Dr. Nathaniel L. Britton, Director in chief, New York Botanical Garden, New York City;

Joseph Henry, by Dr. Robert S. Woodward, President, Carnegie Institution, Washington, D. C.;

Louis Agassiz. Letters were read from the Rev. Edward Everett Hale, an


FRANKLIN

scientific personal friend of Professor Agassiz, and Professor F. W. Putnam, of Harvard University, and remarks were made by Professor Addison E. Verrill of Yale University and Dr. G. D. Walcott, Director of the U. S. Geological Survey.

JAMES DWIGHT DANA, by Dr. Arthur Twining Hadley, President, Yale University, New Haven, Conn.;

SPENCER FULLERTON BAIRD, by Dr. Hugh M. Smith, Deputy Commissioner, Bureau of Fisheries, Washington, D. C.;

JOSEPH LEIDY, by Professor William Keith Brooks, Johns Hopkins University, Baltimore, Md.;

EDWARD DRINKER COPE, by Dr. Henry Fairfield Osborn, Curator, Department of Vertebrate Paleontology, American Museum of Natural History.

The addresses as delivered were as follows:

BENJAMIN FRANKLIN

By S. Weir Mitchell.

We are here, as I understand, to unveil memorial busts of Americans distinguished in science, and I am honored by the privilege of speaking of Benjamin Franklin. This man, the father of American Science, was possessed of mental gifts unequalled in his day. Even yet he holds the highest place in the intellectual world, where, in his time, also had few interests outside of politics. But no man entirely escapes his period. Thus in every life there is much that is of its time and place. That, paraphrasing Goldsmith, we may say that Franklin to country gave up what was meant for mankind, when, with deep regret he resigned in middle life all hope of whole-souled devotion to science. While most productive, his scientific fertility was the more remarkable because of the other forms of fruitful activity which, in a life that knew no rest, left small leisure for those hours of quiet thought, without which science is fruitful of result.

There is a Hall of Fame not built by the hand of man. It is the memory of mankind. In many of its galleries this man's bust could with justice be placed. Diplomacy would claim him as of her greatest. For him would be the laurel of a long-tried wisdom. Among statesmen his wisdom would be welcomed. Who of the masters of English prose shall in that hall of fame be more secure of grateful remembrance, and who more certain of a place among men of science?

BENJAMIN FRANKLIN

Born, Boston, January 17, 1706.
Died, Philadelphia, April 17, 1790.

Physicist, author, editor, philosopher

Demonstrated the identity of lightning and electricity

intimate personal friend of Professor Agassiz, and Professor F. W. Putnam, of Harvard University, and remarks were made by Professor Addisson E. Verrill of Yale University and Dr. C. D. Walcott, Director of the U. S. Geological Survey;

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There is a Hall of Fame not built by the hand of man. It is the memory of mankind. In many of its galleries this man's bust could with justice be placed. Diplomacy would claim him as of her greatest. For him would be the laurel of administrative wisdom. Among statesmen he would be welcomed. Who of the masters of English prose shall in that hall of fame be more secure of grateful remembrance, and who more certain of a place among men of science?

As an investigator of Nature and of Nature's laws he is materially represented here by right of eminent achievement. Let us as men of science feel proud that Franklin's fame as a philosopher did much to win for Franklin the diplomatist such useful consideration and respect as led to final success.

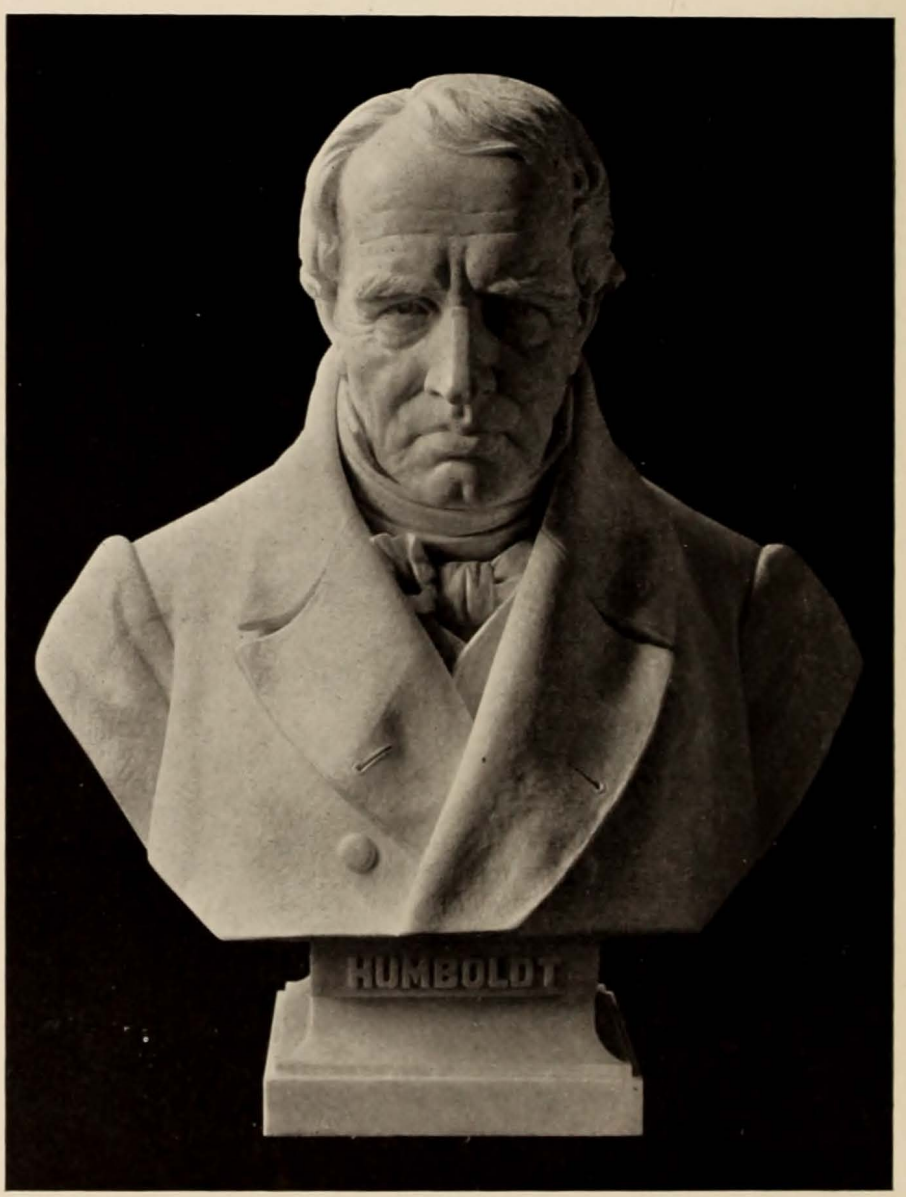
Many of those you honor today had moral and temperamental peculiarities which more or less influenced their lives and are common to men of science. Most of them cared little about making money; still less about keeping it. Franklin on the contrary dreaded poverty; was careful in business, made fruitful investments and died rich; nevertheless like the typical man of science he refused to make money out of his discoveries, or to protect his inventions by patents. In him the man of science, unselfish, free from money greed, seemed to exist apart from all those other men who went to the making of the many-minded Franklin. In another way he was singularly unlike such typical men of science as Henry, in physics, and Leidy, in natural history. When Franklin made a discovery, his next thought was as to what practical use it could be put. If he made some novel observation of nature, he asked himself at once how he could make it serve his fellow men. The great reapers of the harvest of truth commonly leave the inventor to make practical use of their unregarded thought.

Leaving the wide land to do justice to Franklin, the model citizen and great diplomatist, here we crown with the assured verdict of posterity Franklin, the man of pure science. Here we welcome him to this goodly fellowship of those who communed with Nature and read the secrets of the Almighty Maker.

ALEXANDER VON HUMBOLDT.

Mr. President, Gentlemen:

His Excellency, the German Ambassador, whom heavy official duties retain at Washington, has requested me to represent him on this occasion and to express to you his hearty congratulations on this event on which through Mr. Jesup's generous munificence this commemorative tribute is paid to the world's great masters of science, a day on which this magnificent museum of natural history has received a donation which will awake a solemn sense of reverence and make this abode


HUMBOLDT

henceforth a temple of devotion to the founders and promoters of natural science.

Whoever honors the memory of great men, honors science and honors himself, and so the Ambassador has asked me to convey to the generous donor, the tireless promoter of science, Mr. Jesup, the expression of his sincerest admiration and of his heartfelt thanks for the honor which will be conferred, also upon the great German scholar, Alexander von Humboldt.

In this immortal man, whose bust you have gathered to unveil, the world reverés its greatest master since the days of Aristotle. His genius covered all that man has ever thought, done and observed in nature. There is no branch of human knowledge into which his mind did not penetrate. His "Cosmos," that marvellous monument of meditation and research, is a new book of Genesis in which the Universe mirrors itself in all its vastness and minuteness "from the nebulæ of the stars" — in his own words — "to the geographical distribution of mosses on granite rocks."

By his wonderful talent of research, by his almost superhuman power to divine [illegible] science taught mankind how to read the book of nature, how to understand its great mysteries. The series of [illegible] this mighty genius is, as well as the other specialized branches of science developed by him, sufficiently known to all.

[illegible] practical relation with life. Thus he not only elevated the standard of culture of the whole world by many steps, but he also became from a practical point of view the benefactor of mankind in many branches of common life,— as trade, commerce, navigation.

He taught us how to conceive the beauty and sublimity of nature in its every form and motion. His studies are not a matter merely of memory and of dry meditation, to him Nature was rather the inexhaustible source of pure and deep enjoyment, by which the heart is purified and ennobled and men are brought nearer to perfection.

It is not necessary to give you a more detailed picture of his life. All this is so well known and so dear to the whole learned world of America, for never has a foreign scholar been more honored in this country than Alexander von Humboldt. To realize this we need only recall the celebrations which took place in his memory throughout all

ALEXANDER VON HUMBOLDT

Born, Berlin, September 14, 1769
Died, Berlin, May 6, 1859

Geographer, traveler, philosopher

Described the surface features and the geological structure of many lands

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By his wonderful talent of research, by his almost superhuman power to divine eternal laws, this great interpreter of science taught mankind how to read the book of nature, how to understand its great mysteries. The series of sciences, originated by this mighty genius is, as well as the other manifold branches of science developed by him, sufficiently known to all.

In all his investigations his ultimate aim was to bring theory into practical relation with life. Thus he not only elevated the standard of culture of the whole world by many steps, but he also became from a practical point of view the benefactor of mankind in many branches of common life,— as trade, commerce, navigation.

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America both at the time of his death and on the occasion of the centennial anniversary of his birth.

Humboldt devoted five years of his life to scientific investigations in South and Central America, in Mexico and in Cuba. He ascertained the course of the greatest rivers; he climbed the summits of mountains where man's foot had never trod before; he studied vegetation, astronomical and meteorological phenomena, gathered specimens of all natural products and a great deal of historical information about the early population of these parts of the New World. It was he that drew the first accurate maps of these regions. With almost prophetic forecast of the needs of generations to come, he examined the Isthmus of Panama and considered carefully the possibility of establishing there an interoceanic waterway.

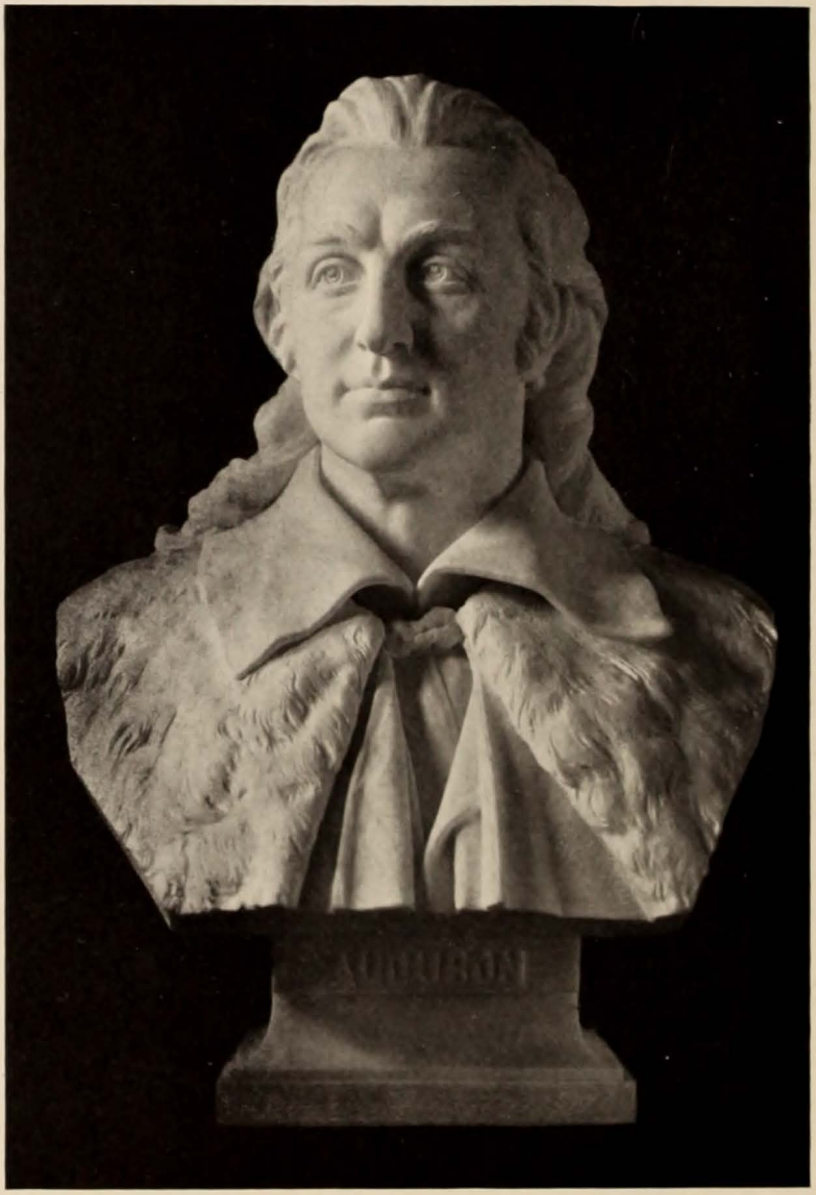
It is well known how great an interest Alexander von Humboldt took in the United States. Indeed, so strongly was he attracted by the problems of the new-born Republic that putting aside even his habitual scientific occupations, he devoted himself entirely for some months to the study of the American people and the institutions of this country.

Finally, the great scientist, he whom people call the scientific discoverer of America, returned to his country, carrying with him a vast store of intellectual and material treasures of science. So abundant were the results, reaped from his expeditions, that he needed the coöperation of the best scholars of his time to compile that great mass of material, and to place it in proper shape and form.

Throughout his long and industrious life, Alexander von Humboldt ever retained his love for and devotion to the country where his great field of labor lay, and for its people with whom he always felt closely connected by his love for freedom in thought and for liberty. It is a well-known fact that in his later days of all the foreigners, who knocked at his door, no one was more heartily welcomed than the American citizen.

The benefits of his investigations in America returned to that country in the course of time. No wonder that her people recognize him as their benefactor. Another great man, whose monument will be unveiled today, and most deservedly placed beside the one of Alexander von Humboldt, Louis Agassiz, says of him:

"To what degree we Americans are indebted to von Humboldt, no


AUDUBON

of illustrated volumes on the Birds [1] and Quadrupeds [2] of North America, his Synopsis of Birds,[3] and the Journals [4] of his expeditions to Labrador and to the Missouri and Yellowstone Rivers.

The preparation and publication of his elephant folio atlases of life-size colored plates of birds, begun in 1827 and completed in 1838, with the accompanying volumes of text (the "Ornithological Biography," 1831-1839), was a colossal task. But no sooner was it accomplished than an equally sumptuous work on the mammals was undertaken, and, with the assistance of Bachman, likewise carried to a successful termination. For more than three-quarters of a century the splendid paintings which adorn these works, and which for spirit and vigor are still unsurpassed, have been the admiration of the world.

In addition to his more pretentious works, Audubon wrote a number of minor articles and papers and left a series of "Journals," since published by his grand-daughter, Miss Maria R. Audubon. The Journals are full to overflowing with observations of value to the naturalist and, along with the entertaining "Episodes," throw a flood of light on contemporary customs and events. Incidentally, they are by no means to be lost sight of by the historian.

In searching for material for his books Audubon traveled thousands of miles afoot in various parts of the eastern states, from Maine to Louisiana; he also visited Texas, Florida and Canada; crossed the ocean several times, and conducted expeditions to far-away Labrador and the then remote Missouri and Yellowstone Rivers. When we remember the limited facilities for travel in his day, the scarcity of railroads, steamboats and other conveniences, we are better prepared to appreciate the zeal, determination and energy necessary to accomplish his self-imposed task.

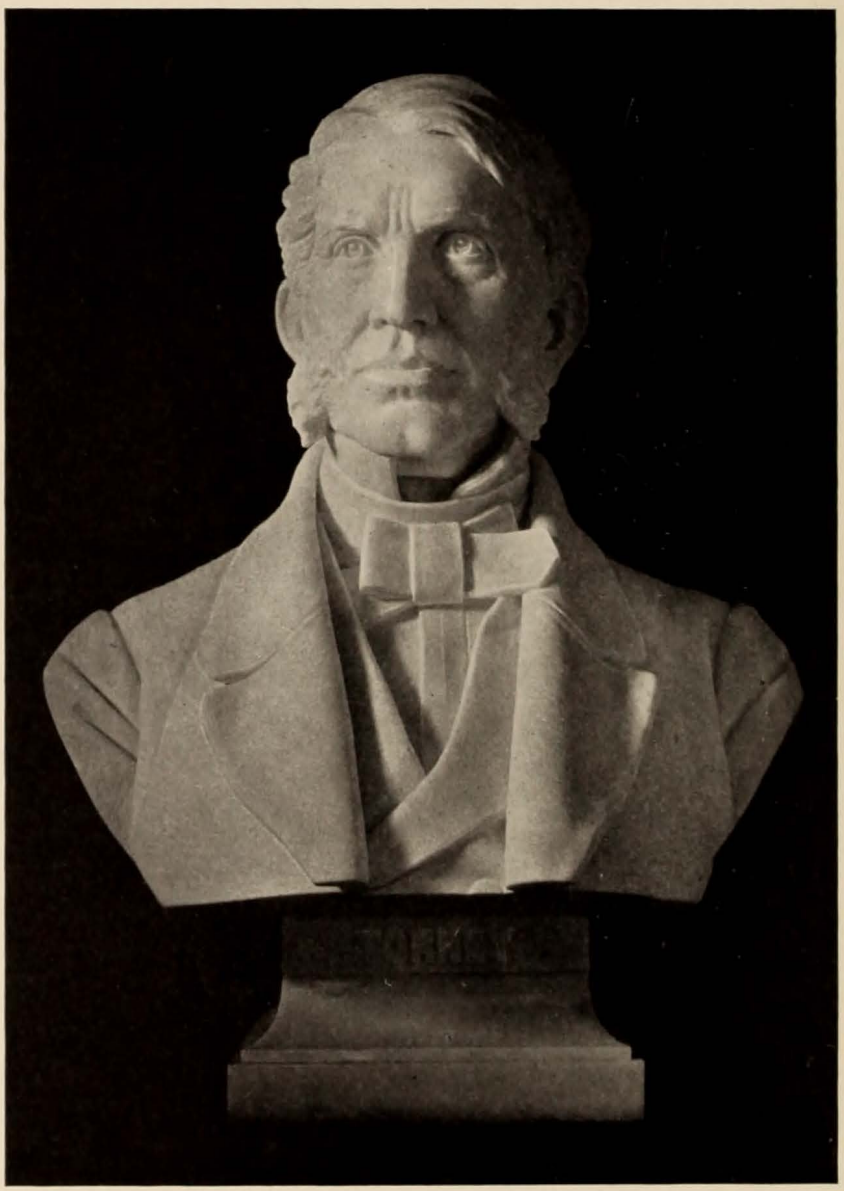
That it was possible for one man to do so much excellent field work, to write so many meritorious volumes and to paint such a multitude

[1] *The Birds of America,* 4 atlases, double elephant folio colored plates. London, 1827–1838; Ornithological Biography, an account of the habits of the birds of the United States. 5 vols. Royal 8vo, Edinburgh, 1831–1839.

[2] *The Quadrupeds of North America* by John James Audubon and Rev. John Bachman. 3 vols. Royal 8vo text, and elephant folio atlas of colored plates. New York, 1846–1854.

[3] *Synopsis of Birds of North America.* Edinburgh & London, 1839.

[4] *Audubon and his Journals* by Maria R. Audubon. 2 vols. 8vo. New York, 1897.



JOHN TORREY

Born, New York, August 15, 1796
Died, New York, March 10, 1873

Botanist, chemist

One of the founders of botanical science in the United States

of remarkable pictures must be attributed in no small part to his rare physical strength, for do not intellectual and physical vigor usually go hand-in-hand and beget power of achievement? Audubon was noted for these qualities. As a worker he was rapid, absorbed and ardent; he began at daylight and labored continuously till night, averaging fourteen hours a day, allowing, it is said, only four hours for sleep.

In American ornithology, in which he holds so illustrious a place, it was not his privilege to be in the strict sense a pioneer, for before him were Vieillot, Wilson and Bonaparte; and contemporaneous with him were Richardson, Nuttall, Maximilian Prince of Wied and a score of lesser and younger lights some of whom were destined to shine in the near future.

Audubon was no closet naturalist — the technicalities of the profession he left to others — but as a field naturalist he was at his best and had few equals. He was a born woodsman, a lover of wild nature in the fullest sense, a keen observer and an accurate recorder. In addition he possessed the rare gift of instilling into his writings the freshness of nature and the vivacity and enthusiasm of his own personality.

His influence was not confined to devotees of the natural sciences, for in his writings and paintings, and in his personal contact with men of affairs both in this country and abroad, he exhaled the freshness, the vigor, the spirit of freedom and progress of America, and who shall attempt to measure the value of this influence to our young republic?

Audubon's preëminence is due not alone to his skill as a painter of birds and mammals, or to the magnitude of his contributions to science, but also to the charm and genius of his personality, a personality that profoundly impressed his contemporaries, and which, by means of his biographies and journals, it is still our privilege to enjoy. His was a type now rarely met, combining the grace and culture of the Frenchman with the candor, patience and earnestness of purpose of the American. There was about him a certain poetic picturesqueness and a rare charm of manner that drew people to him and enlisted them in his work. His friend, Dr. Bachman of Charleston, tells us that it was considered a privilege to give to Audubon what no one else could buy. His personal qualities and characteristics appear in some of his minor papers, notably the essays entitled "Episodes." These serve to reveal, perhaps better than his more formal writings, the keenness of his insight, the kindness of his heart, the poetry of his nature, the power of his imagination and the vigor and versatility of his intellect.

JOHN TORREY.

By Nathaniel L. Britton.

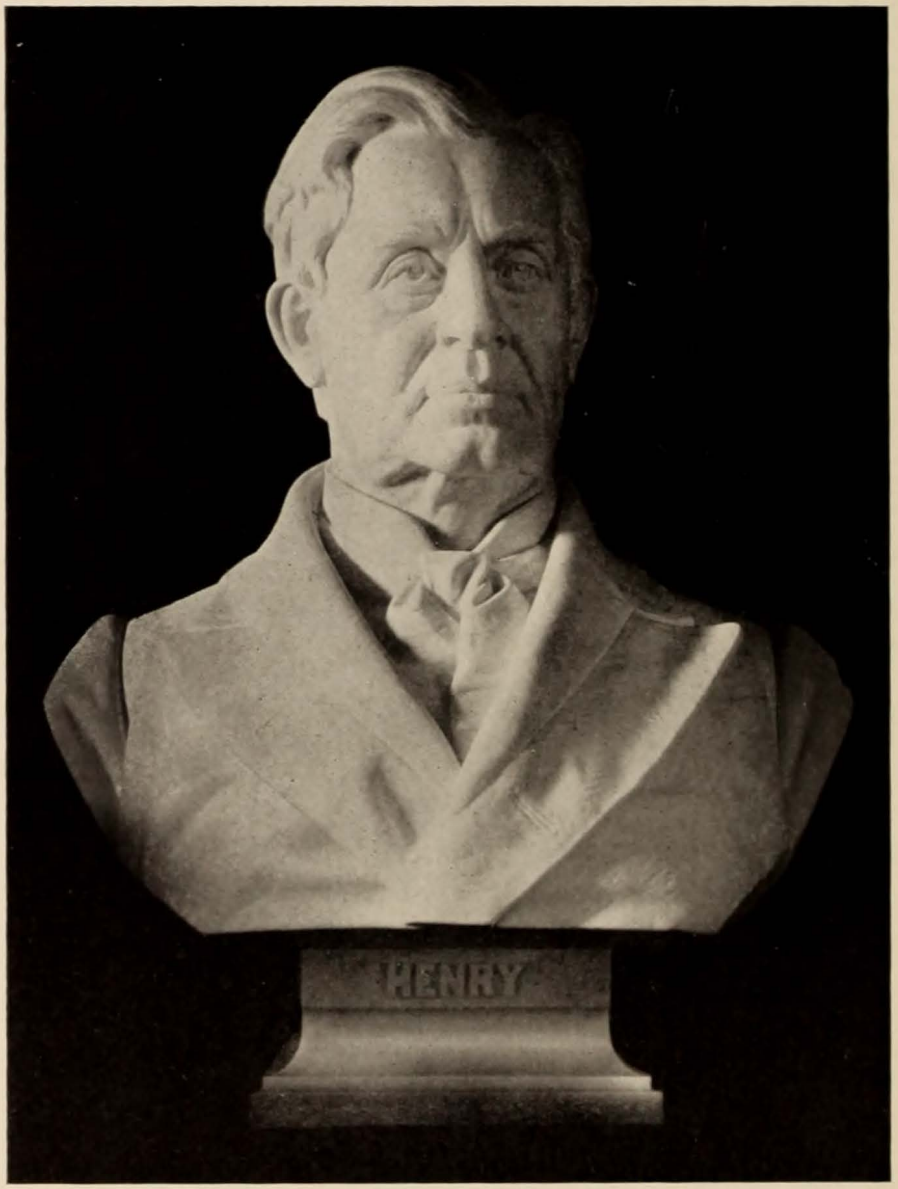
As a pioneer of American botany, John Torrey naturally finds a place among the men whose works we gladly celebrate today in this grand institution developed in the city where he was born; where he resided the greater part of his life, and where he died. Today's recognition of Torrey as a master of botanical science, is therefore peculiarly appropriate in New York, where he is already commemorated by the society which bears his name; by the professorship in Columbia University named in his honor, and by his botanical collections and library deposited by Columbia University at the New York Botanical Garden.

Dr. Torrey was born August 15, 1796, and died March 10, 1873, nearly thirty-four years ago; the pleasure of his personal acquaintance is therefore known to but few persons now living. We have abundant evidence, however, that he was honored and beloved to a degree experienced by but few; righteousness was instinctive in him; aid to others was his pleasure; he was tolerant and progressive, and his genial presence was a delight to his associates.

He was educated for the profession of medicine, graduating from the College of Physicians and Surgeons in 1818, but he soon abandoned it and in 1824 became professor of chemistry at West Point; after three years service there, he was elected professor of chemistry and botany in the College of Physicians and Surgeons, a position which he held for nearly thirty years, during part of this period lecturing on chemistry also at Princeton: he was also United States assayer in New York from 1854 until his death.

Dr. Torrey's attention was directed to botany during his youthful association with Professor Amos Eaton, and his interest in that science was subsequently stimulated during his medical studies by the lectures of Professor David Hosack. It early became his favorite study, and, notwithstanding his noteworthy services to chemistry, his fame rests on his botanical researches, although they were accomplished during his hours of rest and recreation, — largely during the night.

His botanical publications began in 1819 with "A Catalogue of Plants Growing Spontaneously within Thirty Miles of the City of New York," published by the Lyceum of Natural History, now the New York Acad-


HENRY

emy of Sciences, and were completed the year after his death in the "Phanerogamia of Pacific North America," in Vol. 17 of the Report of the United States Exploring Expedition. His contributions to botany include more than forty titles, many of them volumes requiring years of patient study; they throw a flood of light on the plants of North America, and form a grand contribution to knowledge. His collections, on which these researches are based, were annotated and arranged by him with scrupulous care and exactness, and are treasured as among the most important of all scientific material in America.

JOSEPH HENRY.

By Robert S. Woodward.

This time, one hundred years ago, Joseph Henry, whose name and fame we honor today, was a lad seven years of age. He was born at Albany, New York, of Scotch parentage, his grand parents on both sides having come from Scotland to the Colony of New York, in 1775.

Doubtless he had in his mature years affirmed that "The future character of a child, and that of a man also, is in most cases formed probably by the age of seven years." At any rate, he found, when he was seven years old, he had determined to devote his life to the acquisition of knowledge. Thus he became, in turn, student; teacher; civil engineer in the service of his native State; professor of mathematics and natural philosophy in the Albany Academy; professor of natural philosophy in the College of New Jersey — now Princeton University — and a pioneer investigator and discoverer of the first order before he was thirty-three years of age.

His inventions and discoveries in electromagnetism especially are of prime importance. They include the inventions of the electromagnetic telegraph and the electromagnetic engine and the discovery of many of the recondite facts and principles of electromagnetic science.

From the age of thirty-three, when he took up the work of his professorship at Princeton, till the age of forty-seven, when he was called to the post of Secretary of the Smithsonian Institution, he pursued his original investigations with untiring zeal and with consummate experi-

JOSEPH HENRY

Born, Albany, N. Y., December 17, 1797
Died, Washington, D. C., May 13, 1878

Physicist

Noted for his investigations in electromagnetism
First secretary of the Smithsonian Institution

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Doubtless he had himself in mind when in his mature years he affirmed that "The future character of a child, and that of a man also, is in most cases formed probably before the age of seven years." At any rate, he found himself early, for at the age of sixteen he had determined to devote his life to the acquisition of knowledge. Thus he became, in turn, student; teacher; civil engineer in the service of his native State; professor of mathematics and natural philosophy in the Albany Academy; professor of natural philosophy in the College of New Jersey — now Princeton University — and a pioneer investigator and discoverer of the first order before he was thirty-three years of age.

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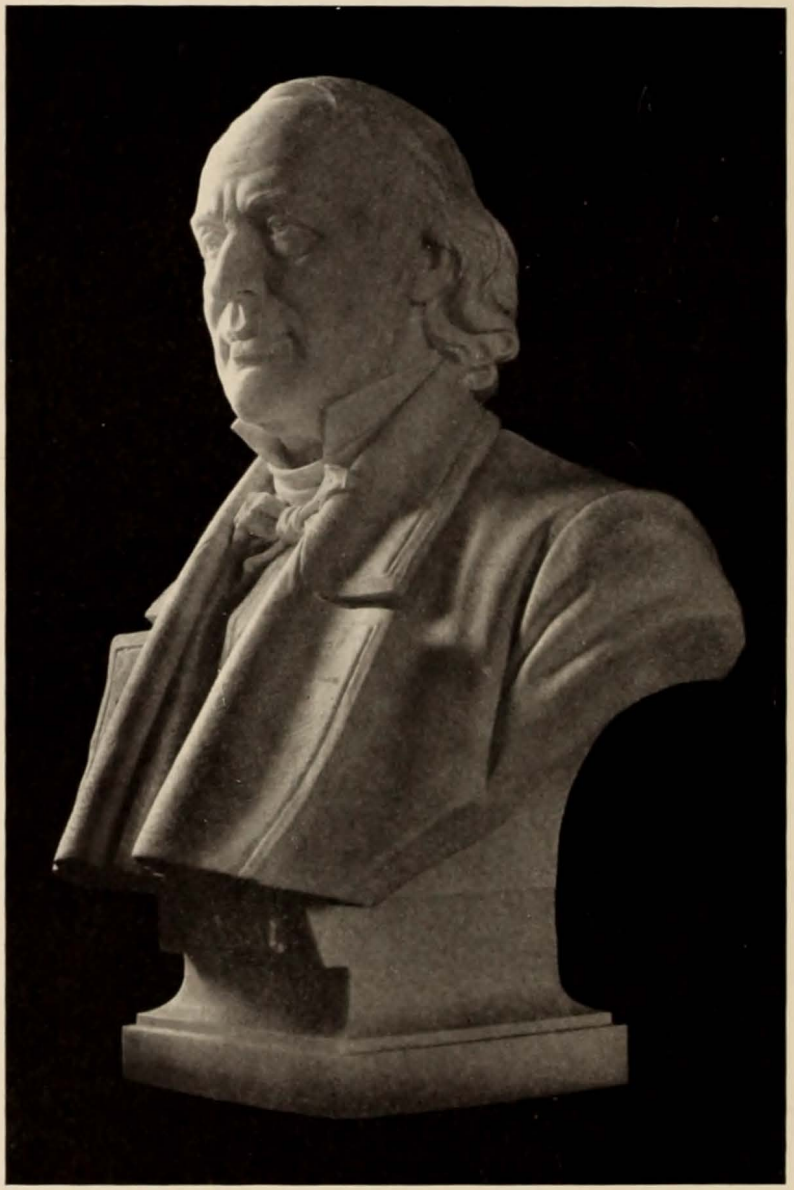
mental skill and philosophic insight. It was during this period that Henry and Faraday laid the foundations for the recent wonderful developments of electromagnetic science. The breadth as well as the depth of Henry's learning is indicated by the fact that he found time during this busy period for excursions and for lectures in the fields of architecture, astronomy, chemistry, geology, meteorology, and mineralogy in addition to his lectures and researches in physics.

He was a man rich in experience and ripe in knowledge when, in 1846, he assumed the administrative duties implied by the bequest of James Smithson, "To found at Washington, under the name of the Smithsonian Institution an Establishment for the increase and diffusion of knowledge among men." Thenceforth, for thirty-two years, until his death in 1878, he devoted his life to the public service, not alone of our own country, but of the entire civilized world. In this work he manifested the same creative capacity that had distinguished his earlier career in the domain of natural philosophy. He became an organizer and a leader of men. To his wise foresight we owe not only the beneficent achievements of the Smithsonian Institution itself, but also, in large degree, the correspondingly beneficent achievements of the Naval Observatory, the Coast and Geodetic Survey, the Weather Bureau, the Geological Survey, the Bureau of Fisheries and the Bureau of American Ethnology; for to Henry, more than to any other man, must be attributed the rise and the growth in America of the present public appreciation of the scientific work carried on by governmental aid.

We may lament, with John Tyndall, that so brilliant an investigator and discoverer as Henry should have been sacrificed to become so able an administrator. And American devotees to mathematico-physical science may be pardoned for entertaining an elegiac regret that Henry as a pioneer in the fields of electromagnetism did not have the aid of a penetrating mathematical genius, as Faraday had his Maxwell. But posterity, just in its estimates towards all the world, will recognize in Henry, as we have recognized in our earlier hero, Benjamin Franklin, a many-sided man — a profound student of Nature; a teacher whose moral and intellectual presence pointed straight to the goal of truth; an inventor who dedicated his inventions immediately to the public good; a discoverer of the permanent laws which reign in the Sphinx-like realm of physical phenomena; an administrator and organizer of large enterprises which have yielded a rich fruitage for the enlighten-



LOUIS AGASSIZ

Born, Motier, Switzerland, May 28, 1807
Died, Cambridge, Mass., December 14 1873

Zoölogist, ichthyologist

Celebrated lecturer and writer on natural history in general

ment and for the melioration of mankind; a leader of men devoted to the progress of science; a patriot, friend and counsellor of Abraham Lincoln in the darker days of the Republic — in short, an exemplar for his race, a man whose purity and nobility are here fitly symbolized in enduring marble for our instruction and guidance and for the instruction and the guidance of our successors in the centuries to come.

LOUIS AGASSIZ.

A Letter from Edward E. Hale.

Read by Addison E. Verrill, who added interesting personal reminiscences of Agassiz.

Washington, D. C., December 8, 1906.

I think that the first time when I ever saw Agassiz was at one of his own lectures early in his American life. This was a description of his ascent of the Jungfrau. I think it was wholly extempore, and, though he was new in his knowledge of English, it was idiomatic and thoroughly intelligible. At the end, as he described the last climb, hand and foot, by which, as it seems, men come to the little triangular plane, only three feet across, which makes the summit, he quickened our enthusiasm by describing the physical struggle by which he lifted himself so that he could stand on this little three-foot table. He said, "one by one we stood there, and looked down into Swisserland." He bowed and retired.

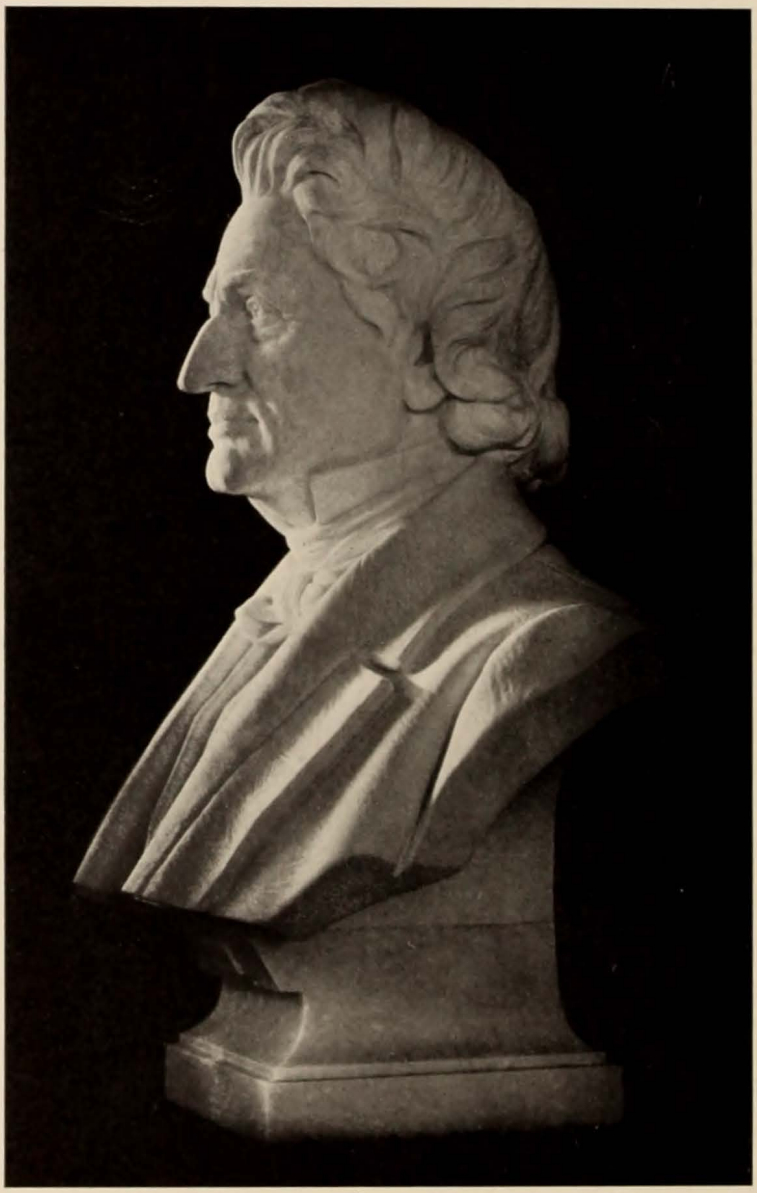
I know I said at once that Mr. Lowell, of our Lowell Institute, who had "imported Agassiz," (that is James Lowell's phrase) might have said before the audience left the hall, "You will see, ladies and gentlemen, that we are able to present to you the finest specimen yet discovered of the genus *homo* of the species *intelligens*."

And looking back half a century, on those very first years of his life in America, I think it is fair to say that wherever he went he awakened that sort of personal enthusiasm. And he went everywhere. He was made a professor in Harvard College in 1848. But he never thought of confining himself to any conventional theory of a college professor's work. He was not in the least afraid of making science popular. He

flung himself into any and every enterprise by which he could quicken the life of the common schools, and in forty different ways he created a new class of men and women. Naturalists showed themselves on the right hand and on the left. I have seen him address an audience of five hundred people, not twenty of whom when they entered the hall thought they had anything to do with the study of Nature. And when after his address they left the hall, all of the five hundred were determined to keep their eyes open and to study Nature as she is. From that year 1848, you may trace a steady advance in Nature Study in the New England schools.

That is to say, that his distinction is that of an educator quite as much as it is that of a naturalist. In 1888, Lowell said, in his quatermillennial address at Harvard College, that the College had trained no great educator, "for we imported Agassiz." A great educator he truly was.

When Agassiz was appointed Professor he was forty-one years old. In my first personal conversation with him he told me a story which may not have got into print, of his own physical strength. He spoke as if it were then an old experience to him. Whether he were twenty-five or thirty-five when it happened, it shows how admirable was his training and his physical constitution. He had been with a party of friends somewhere in eastern Switzerland. They were travelling in their carriages; he was on foot. They parted with the understanding that they were to meet in the Tyrol, at the city of Innsbruck. Accordingly the next morning, Agassiz rose early and started through the mountains by this valley and that, as the compass might direct or his previous knowledge of the region. He did not mean to stop for study and they did not. But he had no special plan as to which hamlet or cottage should cover him at night. Before sundown he came in sight of a larger town than he expected to see, in the distance, and calling a mountaineer, he asked him what that place was. The man said it was Innsbruck. Agassiz said that that could not be so. The man replied with a jeer that he had lived there twenty years, and had always been told that that was the name of the place, but he supposed Agassiz knew better than he did. Accordingly Agassiz determined that he would sleep there and did so. The distance was somewhere near seventy miles. I know it gave me the impression of a walk through the valley passes at the rate of four miles an hour, for sixteen or seventeen hours.



In later life Agassiz made to us some prophecies in which we may trace his enjoyment of the finest physical health and strength. Health and strength indeed belonged to everything which he said and did.

Among other things he said, twenty-five years ago, that the last years of our century, — the twentieth, would see a population of a hundred million of people in the valleys of the upper Amazon. I like to keep in memory this brave prophecy, because I am sure it will come true.

From a Letter from Professor F. W. Putnam.

Read by Charles D. Walcott, who gave also his own token of appreciation of Agassiz.

"It is a real grief to me that I cannot take this opportunity to offer tribute to my beloved and honored teacher, — Louis Agassiz. What a pleasure it would be to me to say a few words of appreciation of that great and good man. Not alone we speak of his scientific achievements, which are known the world over, but, from my intimate association with the great naturalist, I know how he, years ago, for the advancement and encouragement of the study of natural history, to picture his inspiring [illegible] on his goodness of heart, his genial [illegible] wonderful power of winning the life-long devotion of [illegible]

JAMES DWIGHT DANA.

By Arthur T. Hadley.

It was my privilege to know James Dwight Dana intimately during my early years. To boyhood's imagination his figure typified the man of science; his life personified the spirit of scientific discovery. Wider acquaintance with the world has not in any way dimmed the brightness of that early impression.

The services of the geologist are today recognized by every one, and sought by all who can afford them. If he would make a voyage of exploration and discovery, the resources of the world of finance are

JAMES DWIGHT DANA

Born, Utica, N. Y., February 12, 1813
Died, New Haven, Conn., April 14, 1895

Geologist, mineralogist, zoölogist

One of the principal founders of geological science in the United States

In later life Agassiz made to us some prophecies in which we may trace his enjoyment of the finest physical health and strength. Health and strength indeed belonged to everything which he said and did.

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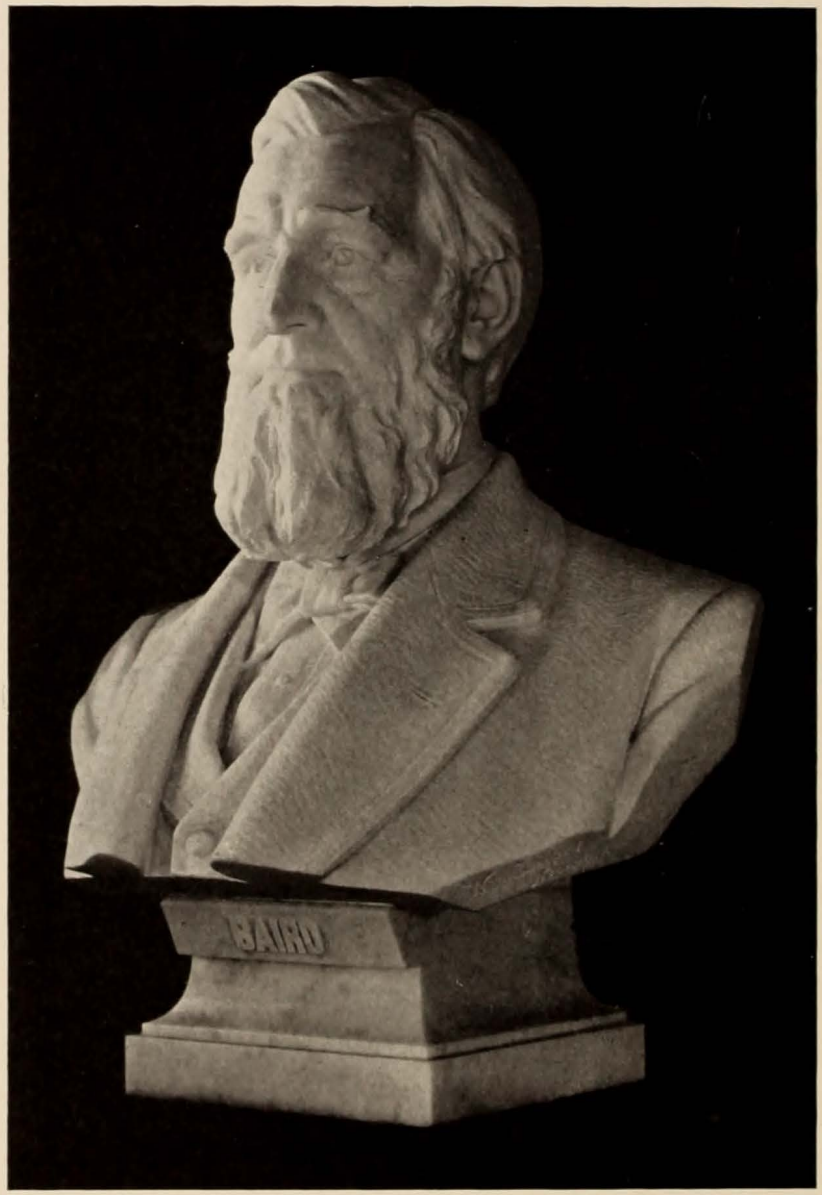
placed at his disposal. No such aids were given two generations ago. In Dana's journeyings he had to surmount hardship and peril, and to meet the coldness of those who knew not the value of the quest which he pursued. He and his contemporaries were like the knights errant of chivalry, devoting their lives to an ideal. They were men of faith, who combined the spirit of the missionary and the inspiration of the poet with the clear vision of the observer.

The largeness of Dana's work was commensurate with the largeness of his inspiration. It fell to his lot not only to fill out many pages of the record of the building of the world, as written in the fossil life of America, but to show in important ways the methods by which that building was accomplished. His creative brain never rested content with mere description of facts. He had the more distinctively modern impulse to reconstruct the process by which those facts were brought to pass. From his observations of coral islands in the various stages of their growth he deduced a geologic principle of world-wide importance. It is this characteristic which makes the great modern German school of geologists headed by Suess look to Dana as their precursor, more than to any other man of his generation.

He was not content with the work of discovery alone. The teaching spirit was strong within him. The pioneers in science needed editors and expositors who should make their results known. In each of these capacities Dana's achievements were phenomenal. Of his work as an editor he has left the files of the American Journal of Science as a monument. Of his work as an expositor those who have heard his lectures and attended his class room exercises can speak with unbounded enthusiasm. He was one of the rare men who by presence and voice and manner could bring the truths and ideals of science home even to those pupils with whom scientific study could never be more than an incident in their lives.

But above all his works and above all his qualities stands the figure of Dana himself — more than an explorer, more than a discoverer, more than a teacher; his countenance, as it were, illuminated by a touch of the light of a new day for which the world was being prepared.

> "His life was gentle; and the elements
> So mixed in him that Nature might stand forth
> And say to all the world, 'This was a man.'"


SAIRD

SPENCER FULLERTON BAIRD

By Hugh M. Smith.

The life, the character, the work of Spencer Fullerton Baird entitle him to recognition in any assemblage and on any occasion where honor is paid to those who have been their country's benefactors through illustrious achievements in science.

Developing a taste for scientific pursuits at a very early age, and confirmed in those pursuits through the influence of friendships with Agassiz, Audubon, Dana and other leading scientists of the time, Baird was selected as assistant secretary of the Smithsonian Institution when only twenty-seven years old, and there entered on a career devoted to the promotion, diffusion and application of scientific knowledge among men, and marked by dignity, sound judgment, fidelity to duty, versatility and general usefulness.

In the many phases of his intellectual development he resembled Franklin and Cope. In the multiplicity of his public duties and in the diversity of the scientific work in which he attained eminence he had few equals in founding, organizing and simultaneously directing a number of great national scientific enterprises he was unique.

To render an adequate account of the branches of scientific endeavor in which he achieved prominence, benefited his own and future generations and added to his country's renown, one would need to be an ornithologist, a mammalogist, an ichthyologist, a herpetologist, an invertebrate zoölogist, an anthropologist, a botanist, a geologist, a paleontologist, a deep-sea explorer, a fishery expert, a fish-culturist, an active administrator of scientific institutions and an adviser of the federal government in scientific affairs.—For Baird was all these and more.

We freely acknowledge today the debt that science owed Baird alive and now owes his memory, especially for his inestimable services as assistant secretary and later as secretary of the Smithsonian Institution, as director of the National Museum and as head of the Commission of Fish and Fisheries. Among all the establishments with which he was connected, this last was prominently and peculiarly his own.

SPENCER FULLERTON BAIRD

Born, Reading, Pa., February 3, 1823
Died, Woods Holl, Mass., August 19, 1887

Zoölogist

Noted for his work in the Smithsonian Institution and the United States Fish Commission

SPENCER FULLERTON BAIRD.

By Hugh M. Smith.

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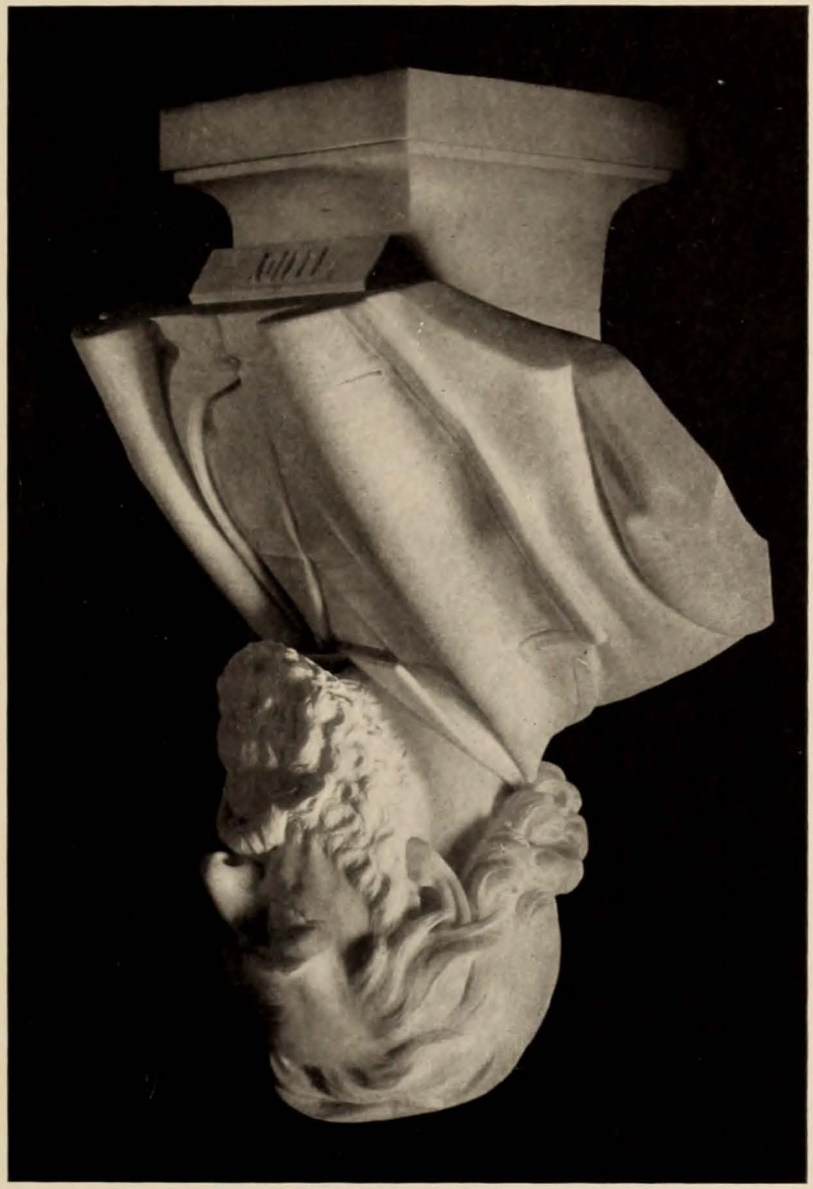
It was conceived by him and created for him, and it would almost appear that he was created for it, for certainly no other person of his day and generation was so admirably fitted for the task of organizing this bureau and of executing the duties that grew out of its functions as successively enlarged by Congress. Insisting on scientific investigations and knowledge as the essential basis for all current and prospective utilitarian work, he drew around him a corps of eminent biologists and physicists; he established laboratories; he laid plans for the systematic study of our interior and coastal waters; he had vessels built that were especially designed and equipped for exploration of the seas. While he thus inaugurated operations which have been of lasting benefit to the fisheries, at the same time he became the foremost promoter and exponent of marine research; and the knowledge we today possess of oceanic biology and physics is directly or indirectly due to Baird more than to any other person. The rapid development of piscicultural science under his guidance gave to the United States the foremost place among the nations in maintaining and increasing the aquatic food supply by artificial means; and it was no perfunctory tribute when in 1880, at the International Fishery Exhibition held in Berlin, Emperor William awarded the grand prize to Baird as "the first fish-culturist in the world."

The spirit of Baird influences the Bureau of Fisheries today, as it does all the other institutions with which he was associated; and since his death nearly twenty years ago, the good that has been accomplished in the interest of fish culture and the fishing industry, and in the conduct and encouragement of scientific work, has been in consequence of the foundations he laid, the policy he enunciated and the example he set.

But conspicuous as were his services to science and mankind; faithful and unselfish as was his devotion to the executive responsibilities imposed on him; beautiful as was his personal character, I conceive that his most enduring fame may result from the enthusiasm with which he inspired others, and the encouragement and opportunity that he afforded to all earnest workers. The recipients of his aid can be numbered by hundreds, and many of them are today his worthy successors in various fields; and their places in turn will gradually be taken by a vast number of men and women who will perpetuate his memory by efficiently and reverently continuing his work.

This evidence of the donor's beneficence is a noble and impressive



JOSEPH LEIDY

Born, Philadelphia, September 9, 1823
Died, Philadelphia, April 30, 1891

Anatomist, zoölogist, palæontologist

Noted for pioneer work among the fossil vertebrates of western United States

memorial of one who merited his country's profoundest gratitude; but the bust signifies something more, for it is a recognition of that zeal, fidelity, self-sacrifice, intelligence and strength in the American character so preëminently typified by Spencer Fullerton Baird.

JOSEPH LEIDY.

By William Keith Brooks.

Joseph Leidy was born in Philadelphia; there he passed his three score years and ten, and there he died. For forty-five years he was an officer in the Philadelphia Academy of Natural Science, and for forty years a professor in the University of Pennsylvania. His character was simple and earnest, and he had such a modest opinion of his talents and of his work, that the honors and rewards that began to come to him in his younger days, from learned societies in all parts of the world, and continued to come for the rest of his life, were an unfailing surprise to him.

His knowledge of anatomy and zoölogy and botany and mineralogy was extensive and accurate and at his ready command. Farmers and horticulturists came to him and learned how to check the ravages of destructive insects; physicians sent rare or new human parasites and were told their nature and habits and the best means of prevention; jewelers brought rare gems and learned their value. His comments, at the Academy, on the recent additions to its collections gave a most impressive illustration of his ready command of his vast store of knowledge of natural history.

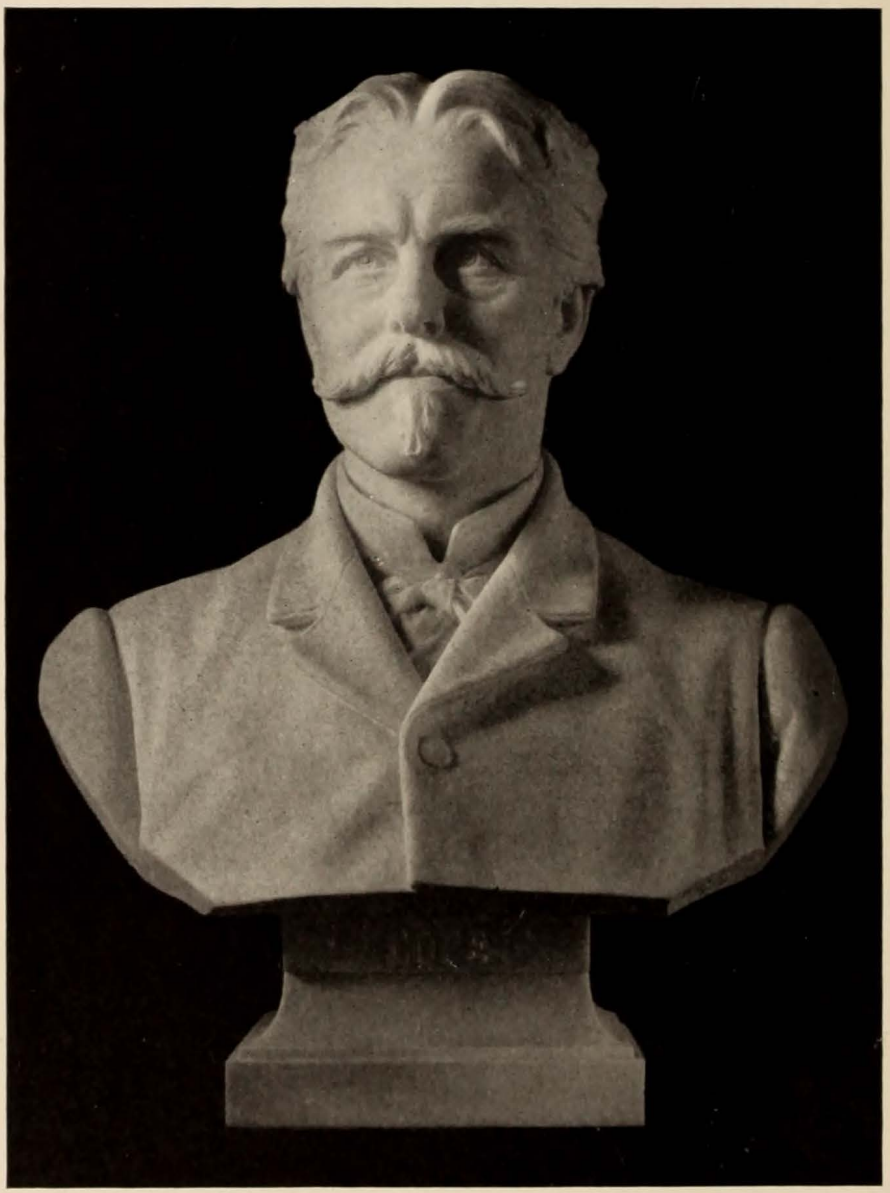
Leidy wrote no books, in the popular meaning of the word. He undertook the solution of no fundamental problem of biology. There are few among his six hundred publications that would attract unscientific readers, or afford a paragraph for a newspaper. They are simple and lucid and to the point. Most of them are short, although he wrote several more exhaustive monographs. They cover a wide field, but most of them fall into a few groups. Many deal with the parasites of mammals — among them, one in which his discovery of trichena in pork is recorded.

Two hundred and sixteen, or about one third, of his publications are

on the extinct vertebrates of North America. His first paper on palæontology was published in 1846, and his last in 1888, as the subject occupied him for more than forty years. He laid, with the hand of a master, the foundation for the palæontology of the reptiles and mammals of North America, and we know what a wonderful and instructive and world-renowned superstructure his successors have reared upon his foundation. It was this work that established his fame and brought his honors and rewards. They who hold it to be his best title to be enrolled among the pioneers of science in America are in the right, in so far as the founder of a great department of knowledge is most deserving of commemoration; but I do not believe it was his most characteristic work.

I can mention but one of the results of his study of American fossils. He showed, in 1846, that this continent was the ancestral home of the horse, and he sketched, soon after, the outline of the story of its evolution which later workers have made so familiar.

More than half his papers are on a subject which seems to me to contain the lesson of his life. Like Gilbert White, he was a home naturalist, devoted to the study of the natural objects that he found within walking distance of his home, but he penetrated far deeper into the secrets of the living world about him than White did, finding new wonders in the simplest living being. In the intestine of the cock-roach, and in that of the white ant, he found wonderful forests of microscopic plants that were new to science, inhabited by minute animals of many new and strange forms. His beautifully illustrated memoir on *A Flora and Fauna Within Living Animals* is one of the most remarkable works in the whole field of biological literature. Another memoir gives the results of his study of the anatomy of snails and slugs. The inhabitants of the streams and ponds in the vicinity of his home furnished an unfailing supply of material for research and discovery, and many of his publications are on aquatic animals. He finally became so much interested in the fresh-water rhizopods that he abandoned all other scientific work in order to devote his attention exclusively to these animals. His results were published in the memoir on *The Fresh-water Rhizopods of North America.* This is the most widely known of his works. It is, and must long be, the standard and the classic upon its subject. I have no time to dwell upon his work as the naturalist of the home — his best and most characteristic work. Its lesson to



EDWARD DRINKER COPE

Born, Philadelphia, July 28, 1840
Died, Philadelphia, April 12, 1897

Palæontologist, biologist, philosopher

Noted for his discoveries among the vertebrate fossils of western United States and his deductions from their study

later generations of naturalists seems to me to be that one may be useful to his fellow-men and enjoy the keen pleasure of discovery and come to honor and distinction, without visiting strange countries in search of rarities, without biological stations and marine laboratories, without the latest technical methods, without grants of money, and, above all, without undertaking to solve the riddles of the universe or resolving biology into physics and chemistry.

If one have the simple responsive mind of a child or of Leidy, he may, like Leidy, "find tongues in trees, books in the running brooks, sermons in stones and good in everything."

EDWARD DRINKER COPE.

By Henry Fairfield Osborn.

In the marble portrait of Edward Drinker Cope, you see the man of large brain, of keen eye and of strong resolve, the ideal combination for a life of science, the man who scorns obstacles, who while battling with the present looks above and beyond. The portrait stands in its niche as a tribute to a great leader and founder of American palæontology, as an inspiration to young Americans. In unison with the other portraits its forcible words are: "Go thou and do likewise."

Cope, a Philadelphian, born July 28, 1840, passed away at the early age of fifty-seven. Favored by heredity, through distinguished ancestry of Pennsylvania Quakers, who bequeathed intellectual keenness and a constructive spirit. As a boy of eight entering a life of travel and observation, and with rare precocity giving promise of the finest qualities of his manhood. Of incessant activity of mind and body, tireless as an explorer, early discovering for himself that the greatest pleasure and stimulus of life is to penetrate the unknown in Nature. In personal character fearless, independent, venturesome, militant, far less of a Quaker in disposition than his Teutonic fellow citizen Leidy. Of enormous productiveness, as an editor conducting the *American Naturalist* for nineteen years, as a writer leaving a shelf-full of twenty octavo and three great quarto volumes of original research. A man of fortitude, bearing material reverses with good cheer, because he lived in the

world of ideas and to the very last moment of his life drew constant refreshment from the mysterious regions of the unexplored.

In every one of the five great lines of research into which he ventured, he reached the mountain peaks where exploration and discovery guided by imagination and happy inspiration gave his work a leadership. His studies among fishes alone would give him a chief rank among zoölogists, on amphibians and reptiles there never has been a naturalist who has published so many papers, while from 1868 until 1897, the year of his death, he was a tireless student and explorer of the mammals. Among animals of all these classes his generalizations marked new epochs. While far from infallible, his ideas acted as fertilizers on the minds of other men. As a palæontologist, enjoying with Leidy and Marsh that Arcadian period when all the wonders of our great West were new, from his elevation of knowledge which enabled him to survey the whole field with keen eye he swooped down like an eagle upon the most important point.

In breadth, depth and range we see in Cope the very antithesis of the modern specialist, the last exponent of the race of the Buffon, Cuvier, Owen and Huxley type. Of ability, memory and courage sufficient to grasp the whole field of natural history, as comparative anatomist he ranks with Cuvier and Owen; as palæontologist with Owen, Marsh and Leidy — the other two founders of American palæontology; as natural philosopher less logical but more constructive than Huxley. America will produce men of as great, perhaps greater genius, but Cope represents a type which is now extinct and never will be seen again.

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AMERICAN MUSEUM OF NATURAL HISTORY