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BIOGRAPHICAL MEMOIR

OF

EDWARD DRINKER COPE

1840-1897

BY

HENRY FAIRFIELD OSBORN

PRESENTED TO THE ACADEMY AT THE ANNUAL MEETING, 1929

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*E. D. Cope*

# CONTENTS

	<i>Page</i>
E. D. Cope.....	Frontispiece
Letter of Transmission.....	127
Introduction .....	129
Ancestry and Boyhood .....	130
Youth .....	132
Young Manhood .....	133
Manhood .....	133
Work with Geological Surveys.....	134
Twenty Years of Intensive Research.....	136
Connection with the Academy of Natural Sciences and the American Philosophical Society.....	138
Editor of the American Naturalist.....	139
Later Years .....	140
Contributions to Geology and Stratigraphy.....	142
Contributions to Herpetology.....	150
Contributions to Ichthyology.....	153
Contributions to Mammalogy.....	154
Cope as a Field Explorer.....	158
Contributions to Ornithology .....	160
Contributions to Palaeontology.....	162
Phylogeny of the Vertebrata.....	163
Contributions to Sociology.....	165
Conclusion .....	170
Bibliography of Edward Drinker Cope.....	172
Introduction .....	172
Bibliography .....	175

## LETTER OF TRANSMISSION

January the thirtieth,  
Nineteen hundred twenty-nine

Edward Drinker Cope, one of the greatest palaeontologists and anatomists America has produced, died on April 12, 1897. Sometime before his death his secretary, Miss Anna M. Brown, had begun work upon his extraordinarily extensive and difficult bibliography. These materials passed into my hands together with a nearly complete set of Cope's writings and his two great collections of fossil vertebrates, including fishes, birds, reptiles and mammals, now in the American Museum of Natural History. Under my direction the bibliography was completely revised by Miss Jannette May Lucas and extensive scientific annotations were made by Dr. William Diller Matthew, Dr. W. B. Veazie, Dr. E. W. Gudger and Dr. William King Gregory. The portions concerning batrachians and reptiles have been verified by Dr. G. Kingsley Noble.

Shortly after Professor Cope's death, Persifor Frazer published a brief bibliography and biography. At the memorial meeting of the American Philosophical Society on November 12, 1897, a biographic symposium was held at which Theodore Gill reviewed Cope's work among the reptiles and fishes, while his contributions to geology and mammalogy were discussed by William Berryman Scott and myself. Appreciative, independent biographies were also written by Hosea Ballou, Marcus Benjamin, J. S. Kingsley and Persifor Frazer, by myself, and Miss Helen Dean King. The prolonged and intensive research into the extremely full life and works of Cope, in which I was first aided by Mrs. Hermann O. Mosenthal, dates back to 1897. This research was suspended for several years and then renewed with still deeper and more extensive research by Miss Helen Warren in the year 1928, continuing up to the present time.

Professor Cope's family has been warmly sympathetic in this

great undertaking and has generously donated to the Osborn Library of the American Museum, the entire family and scientific correspondence of Professor Cope, beginning with the diaries of his boyhood. Some members of Professor Cope's family at the instance of his daughter, Mrs. Julia Cope Collins, have generously contributed a sum to aid in this research, which has been partly sustained also by the Osborn Research and Publication fund of the American Museum of Natural History.

Thus step by step all the materials have been brought together and are now assembled in condensed form for the present Biographical Memoir of the National Academy of Sciences, prepared with the able aid of Mrs. Helen Warren Brown. It is expected that this relatively brief and concise biography of fourteen thousand words will be followed by a volume giving a more comprehensive account of the life and works of this man of remarkable genius.

The bibliography of Cope will be of incalculable value to all workers in vertebrate zoology and palaeontology, as well as in biology and philosophy, because it points out all the available sources, of both permanent and very fugitive character, in which may be found the outpourings of his lifelong observations and the brilliant series of generalizations which flowed from his creative mind.

HENRY FAIRFIELD OSBORN.

# EDWARD DRINKER COPE

BY HENRY FAIRFIELD OSBORN

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## INTRODUCTION

Edward Drinker Cope was born in Philadelphia, the cradle of American philosophic and scientific thought, on July 28, 1840, grew up a contemporary of the palaeontology which Georges Cuvier had founded in 1799, and spent his life and a considerable fortune in its furtherance. Happening to be born with an observing and enquiring mind, he absorbed in childhood the stores of natural history painstakingly gathered by pioneer scientists of the sixteenth, seventeenth and eighteenth centuries, worked them over with genius, adding as he grew older a first hand acquaintance with the unbelievably ancient fossils discovered by fur-traders in the plains of Nebraska, Montana, Wyoming, Colorado, Kansas, New Mexico, Oregon and Texas, and proceeded to astonish his conservative predecessors by setting forth overwhelming evidence of the theory of evolution as traced from fossil through living forms, from the lowest single-celled organism to man.

Altogether he contributed more than 1,300 papers to scientific literature, making known more than 600 species and many genera of extinct vertebrates new to science, many of which he had personally discovered in the Cretaceous strata of Kansas or the Tertiary of Wyoming and Colorado. Among these were some of the oldest known mammalia, obtained in New Mexico where he had served with the United States Geological Survey under G. M. Wheeler in 1874. In 1885 Cope wrote with some satisfaction that he had traced successfully the primitive ancestry of the reptiles, birds and fish, back to their point of origin and that among the mammalia he had done the same thing for the deer, the camels, the musk, the horse, the tapir, the rhinoceros, the cats and dogs, lemurs and monkeys, and had important

evidence of the origin of man among the mammals.<sup>1</sup> The mammals he had traced only in part and was also still baffled by the exact tree of the bears, elephants, hyenas and hogs.

#### ANCESTRY AND BOYHOOD

The Copes of Philadelphia were Quakers, and like many members of the Pennsylvania Society of Friends, very prosperous. They were a branch of an old and distinguished Wiltshire family, one member of which, Oliver, having fallen upon hard times, bought some land from William Penn in 1687 and moved his family to America. They prospered and Oliver's great-grandson, Thomas Pim Cope, became in 1821 proprietor of the Cope line of packets running between Philadelphia and Liverpool. Alfred Cope, son of Thomas, was therefore able to live a more or less retired life in the family place "Fairfield" not far from Philadelphia and to indulge his love for cultivating fine trees, rare shrubs and flowers.

At Fairfield his son, Edward, was born in July 1840 and grew up under his father's tutelage. His early education although ostensibly aimed to make of him either a farmer or a ship-owner, when taken into relation with his strong natural bent, moulded him firmly into a man of science. He was taught the names, characteristics and proper care of the trees and plants under cultivation in his father's eight-acre farm. He was encouraged to observe the habits of the farmyard beasts and to keep pets. He was trained to make accurate maps, beginning with a diagram of the farm and branching out to the several states, the whole United States, the continent of North America, and finally the world. He learned a primary division of animals from his father:

Pigs have bristles,  
Cows have hair,  
Birds have feathers,  
Snakes are bare.

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<sup>1</sup>*Origin of Man and Other Vertebrates*, Professor Edward D. Cope, Popular Science Monthly, September, 1885.

He was also permitted, as he grew older, to use his father's library which included such natural history texts as Mark Catesby on the *Natural History of Carolina, Florida and the Bahama Islands*.

When he was six years old Edward was taken to a museum in Philadelphia, either Barnum's or the one in the Academy of Natural Sciences building. There he saw the Mastodon skeleton and Koch's disproportionate *Hydrarchus* (Zeuglodon), the water king, which had been constructed from the remains of three skeletons to the astonishing length of 114 feet. Stuffed monkeys, alligators and crocodiles were also on display and Edward wrote a full description of the trip to his grandmother, stating characteristically: "Does thee know what that is? I will tell thee." The following year the boy was taken to Boston on one of his grandfather's ships and wrote a little journal along the way, sketching in it starfish, dolphins and flying fish, as well as the Bunker Hill monument. A year or two later he was taken to Cuba and was evidently deeply impressed by the tropical scenery; when he was seventeen he wrote from memory a very vivid description of a ride along a southern beach, skirting a most convincing jungle and palm trees. When he was about nine years old he was sent to school in Philadelphia and his visits to the Academy Museum became frequent. He went alone or with school-fellows and kept careful account of what he had seen, often illustrating by sketches of the animals his attempts at classification by name and characteristics. At thirteen, in 1853, he was sent to the Friends Select School at Westtown, Pennsylvania, where his lessons were usually well reported but the conduct of his restless and mischievous spirit often fell below par; this in spite of many remorseful promises of reform.

The Westtown School library seems to have been well-stocked; there in February 1856 Cope, at the age of fifteen, read Darwin's *Voyage of a Naturalist*<sup>2</sup> and pronounced it too full of geology. The course of school study, however, was the routine

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<sup>2</sup> *Voyage of a Naturalist*, Charles Darwin, Harper Brothers, 1845. 2 vol.



reading, mathematics, Bible study, penmanship, Greek and Latin with a little chemistry thrown in. In the summer the young naturalist made strides ahead in his favorite studies; not being very robust he was sent by his father to work on farms of various relations. These farms differed from year to year; the first was a garden truck farm, the next devoted to wheat and corn and another to fruit raising. By his own account the lad employed his spare time in studying "nurserying, ornithology, herpetology, botany and flageoletology." He explored meadows, woods and fields, collecting birds, snakes, insects, reptiles, fish and flowers, for later comparison in the Philadelphia museum. He became more and more embued with the beauty in Nature, of which he had a strong sense, more and more eager to unravel the plan and meaning of life, both physical and mental, and more and more determined not to become a farmer.

#### YOUTH

He was persistent in this latter determination and advanced so many arguments against the economic wastefulness of the contemporary methods of farming that, when he was nineteen, his father finally gave in and set him to studying French and German under a private tutor. Dr. Joseph Thomas, the scholar selected, was an excellent linguist and developed in his pupil a fluency and familiarity with languages which was of great value to him. Cope consented to the language courses with the express understanding that they would "enable me to read useful books of a literary or scientific character."

His first formal contribution to scientific literature came during this same year of 1859 with his communication of a paper on the *Salamandridae*<sup>3</sup> to the Academy of Natural Sciences at Philadelphia, in whose halls he had been an interested student since his sixth year.

The ambitious youth soon convinced his father of the necessity of his studying comparative anatomy at the University of

<sup>3</sup> On the *Primary Divisions of the Salamandridae*, with Descriptions of Two New Species. *Proceedings of the Academy of Natural Sciences of Philadelphia* (Vol. XI), 1859, pp. 122-128.

Philadelphia under Dr. Joseph Leidy as it would give him a proper knowledge of how to treat stock, should the occasion arise. He further remarked that he was already, at the age of twenty, familiar with the main points of anatomical structure and could perfect himself in the minutiae in a winter.

#### YOUNG MANHOOD

Having completed the course with Leidy in the early Spring of 1861, he spent some months in cataloguing the reptilian collection of the Academy of Natural Sciences and then proceeded to Washington to study the herpetological collections of the Smithsonian Institution under Professor Spencer F. Baird. The winters of 1861-2 and 1862-3 were passed thus in war-torn Washington, while the summers were spent in farm work and in scientific writing. Most of the papers of these years were on herpetology, but one ventured into ichthyology and one into mammalogy. At the age of twenty-two, in the Spring of 1863, Cope went abroad to study the collections at Berlin, Leyden, Munich, Vienna, Paris and London. He remained abroad a year and returned in 1864 to an appointment as professor of natural science in Haverford College, a post he held for three years and then gave up in favor of scientific exploration and writing.

#### MANHOOD

Cope was married in July 1865 by the Quaker ceremony to his distant cousin, Annie Pim. Their only child, Julia, was born in July of the following year. In March 1867 Cope visited Agassiz at Cambridge and examined the great Brazilian collections. Three months later his own life as an explorer of remote and hazardous fields began with the apparently mild proposal of taking his wife and baby to the Virginia Springs for a vacation.

There, in Montgomery County, he explored the cave fauna—a type of investigation in which he was again engaged shortly before his death, thirty years later. In October 1867 he progressed to Maryland, examining the Eocene and Miocene beds which lie between the Potomac and Patuxent rivers. The next

March he turned his attention to the New Jersey marly sands near Pemberton in Burlington County. There he explored with his new found friend, Professor Othniel Charles Marsh of Yale, who was to become one of his bitterest rivals. But in 1868 they explored the marl peaceably together and found three new saurians of apparently known genera, though Cope was not certain of this classification and ascribed them tentatively to *Mosasauros*, *Glavialus* and *Brimosaurus*. The summer of 1869 found him among the mountains of McDowell County, North Carolina, hunting insects, salamanders, and fish and investigating the caves of the Black range, Craggy, Blue Ridge and Great Smoky mountains. Later in the season he lived near Raleigh inspecting the Miocene marl which exists thereabouts. In 1871 Cope's private explorations, which had thus far been financed from his own slender allowance, took him to the Kansas Cretaceous, but his field trips thereafter were in part financed by the national or State Geological Surveys with whom he had first become affiliated in 1865.

#### WORK WITH GEOLOGICAL SURVEYS

Cope was busy with Herpetology in 1865, when Dr. Worthen of the Illinois State Geological Survey sent him the remains of a carboniferous salamanderlike amphibian for description. He named the creature *Amphibamus grandiceps* and transferred his enthusiasm for hunting living reptiles into seeking out the fossil forms. Extinct and living forms he considered together and light was shed from one to the other. In 1870 he gave expression to the results of his studies in a well-illustrated *Synopsis of the Extinct Batrachia, Reptilia and Aves of North America*, a brief diagnosis of groups with descriptions of new genera and species from the coal measures of Linton, Ohio. This was supplemented in 1875 by a *Synopsis of the Extinct Batrachia from the Coal Measures*, which appeared as part of the annual report of the Ohio Survey.

In 1872 his friend F. V. Hayden offered him a post with the U. S. Geological Survey and Cope went to Wyoming to examine the Bridger and Bitter Creek regions with a driving activity

which exhausted him and ended in his first serious illness. The trip began like so many of Cope's with three days and three nights in a stage coach, bumping and jerking into the Wyoming wilderness, and consisted in weeks on horseback in an arid land amid constant danger of Indians, who were decidedly upon the warpath, but who fortunately considered Hayden mad and consequently an object of especial divine protection. The following summer Cope worked in the Colorado Miocene, again with Hayden and in 1875 his *Vertebrata of the Cretaceous Formations of the West* was published by the Government Printing Office. Cope's work with Hayden, however, culminated in the publication in 1884 of a volume, popularly known as Cope's Bible: *The Vertebrata of the Tertiary Formations of the West*.<sup>4</sup> Book One of this work comprised the first half of Cope's final report to the Hayden Survey. It includes the Eocene faunas and a part of the Oligocene (Lower Miocene) Rodentia, Insectivora, etc., Carnivora. The second book, to include the Oligocene (Lower Miocene) Ungulata and the Miocene ("Loup Fork") fauna was never published although a large number of the plates prepared under Cope's direction by William Diller Matthew were published in 1915 by the American Museum of Natural History with the co-operation of the U. S. Geological Survey.<sup>5</sup> The failure to get this volume published was one of the great disappointments of Cope's life. When it became apparent that the original Congressional appropriation for the publication would not be available, he spent many weary weeks and months in Washington from 1886 until 1890, trying to get a special item covering the costs passed as part of the Sundry Civil Bill. He waited upon Congressmen, Senators and Secretaries of the Interior, interviewed, prepared briefs, pleaded, and waited. Several times the item was approved by the Senate, but failed in the House. Finally Cope was referred back

<sup>4</sup> Report U. S. Geol. Survey of the Territories, (Hayden), Vol. III, pp. i-xxxv, 1-1009, Pls. I-LXXVa.

<sup>5</sup> Hitherto Unpublished Plates of Tertiary Mammalia and Permian Vertebrata (With W. D. Matthew). *Amer. Mus. Nat. Hist. Monograph Series No. 2.*

to Major Powell and the volume eventually appeared in the much abridged form of 1915.

Cope served as palaeontologist with the U. S. Geological Survey of the territory west of the 100th Meridian under G. M. Wheeler in 1874 and 1875, working in New Mexico, Montana and Oregon, and eventually publishing his report with that of Wheeler in 1877.<sup>6</sup> The summer of that year [1877] Cope worked with the Wheeler Survey in the Permian of Texas, the results of his investigations being published in several bulletins of the Survey.

Besides his connection with the U. S. Geological Survey, which terminated when Marsh was placed in command, Cope worked with the Indiana State Survey, with the Canadian Geological Survey, and with the Texas State Survey. In the Indiana work he collaborated with Wortman publishing an *Account of the Mammalian Fauna of the Post Pliocene Deposits in the State of Indiana* in 1884 as part of the fourteenth annual report of the State Survey. His studies took him to Canada in the eighties and he became connected with the Canadian Geological Survey with the resultant publication of his *Vertebrata of the Swift Current Creek Region of the Cypress Hills* in that body's annual report of 1885, and of his *Vertebrata from the Tertiary and Cretaceous Rocks of the Northwest Territory* in the Contributions to Canadian Palaeontology, of 1891. The following year he returned to Texas, serving with the State Survey. The chief publication resultant was *A Preliminary Report on the Vertebrate Palaeontology of the Llano Estacado* which appeared in 1893, occupying ninety pages of the fourth annual report of the Survey.

#### TWENTY YEARS OF INTENSIVE RESEARCH

The years after his retirement from the faculty of Haverford College were not solely devoted to work for the various Geological Surveys mentioned above. From late autumn until

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<sup>6</sup> Report upon the Extinct Vertebrata obtained in New Mexico by Parties of the Expedition of 1874. *Report of the U. S. Geogr. Surveys west of the 100th Meridian (Wheeler) IV. pt. II.* pp. 1-370.

early Spring of these years Cope lived in Philadelphia, studying and describing the fossils collected on summer journeys and those sent him by other collectors in the same fields, writing long monographs and short papers, correcting and revising endless proofs, lecturing before the Franklin Institute and the Academy of Natural Sciences, and after 1878 publishing the *American Naturalist* as well. During these winters he occupied no professorial chair, though in 1873 he was considered by Princeton College for the Chair of Natural History. He was not enthusiastic about this position, however, because it would cut into his hours for research, and President McCosh of Princeton, on the other hand, was unenthusiastic about Cope, or so Cope thought, because of his advanced views regarding evolution. Occasional summers of these twenty years of research were spent away from the collecting fields. During the summer months of 1875 Cope remained in Philadelphia in charge of the division of organic material in the permanent exhibit of the Educational department at the Centennial Exposition; geological and palaeontological specimens of the United States were assembled under his direction and in later years he frequently referred to the Exposition with great pride. In 1878 he went abroad to attend the Dublin meeting of the British Association for the Advancement of Science, to renew his familiarity with the fossil collections at London, Paris and Rheims, and to make the acquaintance of palaeontologists and geologists to whom he was already known through his writings. Among these men in the order of Cope's personal preference were, Professors W. Boyd Dawkins, Leith Adams, Macalister (of Dublin), Traquair (of Edinburgh), and Thomas Huxley—all palaeontologists of the Vertebrata—and among geologists, Professor John Evans, Mr. Hicks of Wales and Mr. Pengelly of Cornwall.

Returning to his field work, Cope visited California and Oregon in 1879 making the friendship of Professor Condon of Oregon, with whom he had long discussions of his present work in the Silver Lake district, of the fossils he had found and discovered in the past, and of those he hoped to find in the

future. 1881 took him back to the Santa Fe trail and New Mexico, this time working alone, while in 1882 he returned to Oregon. During the next three summers his eagerness to increase his funds, for the purchase and collecting of material for his precious monographs, led Cope into disaster. He had inherited more than a quarter of a million dollars after his father's death in 1875 and with almost childlike faith he invested his capital in silver mines in Mexico. He personally investigated the mines and detected silver, but failed to detect the schemes of promoters. Seeing his misplaced trust too late he feverishly threw good money to cover bad. Finally in 1886 he realized that he was in very straightened circumstances; he struggled with poverty for the rest of his life.

Honors came to Cope during his years of intensive research. In 1872 he was made a member of the U. S. National Academy of Sciences and in 1878 of the Societie Geologique de France. The Bigsby gold medal of the Geological Society of London was awarded to him the following year. In 1886 he was elected a member of the Imperial Society of Moscow and received the honorary degree of Doctor of Philosophy from the University of Heidelberg. This was his only academic degree. In 1891 the results of his research were recognized by the award of the Hayden Memorial medal. Distinction had also come to him through his connection with the Academy of Natural Sciences, the American Philosophical Society and the *American Naturalist*, of which he was editor and publisher.

#### CONNECTION WITH THE ACADEMY OF NATURAL SCIENCES AND THE AMERICAN PHILOSOPHICAL SOCIETY

Cope's connection with the Academy of Natural Sciences at Philadelphia began with his first visit to its halls, when he was six years old. The publication of his first paper in the Academy Proceedings of 1859 strengthened the bond his constant childhood visits had made and upon coming of age in 1861 he became a member of the Academy, whose herpetological collections had already afforded him his first scientific job. For twenty years thereafter Cope's shorter papers, with the exception of

those appearing in the *American Naturalist*, were usually published by the Academy.

He served it as Curator from 1865 until 1873, as Corresponding Secretary from 1863 until 1876 and as a member of the Council in 1879, but he was not satisfied with it and his outspoken criticism of the management of its affairs, which he believed placed buildings before publications and wealth before accomplishment, made him many enemies. He suggested three fundamental changes in its organization without avail: first that a series of fellowships open only to experts of established reputation be inaugurated; second, that the officers of the Academy should be selected from the fellows only; third, that the Professors should be, *ex officio*, members of the Council. This attempt to keep science for the scientists, as far as the actual machinery was concerned, was frowned upon and defeated.

Finally in 1883 Cope resigned from the Academy and in 1885 described himself as elected to "a position of honor if not emolument in the American Philosophical Society." For years those papers not published by the U. S. Geological Survey, the *American Naturalist* and the *Open Court* or the National Academy of Sciences were included in the proceedings of the American Philosophical Society. Yet in making his will Cope forgot the Philosophical Society and remembered the Academy.

#### EDITOR OF THE AMERICAN NATURALIST

*The American Naturalist* of Salem, Massachusetts, was for sale in 1878; Cope bought a part interest. He moved the magazine to Philadelphia and arranged to edit it jointly with Professor A. S. Packard. In 1887 he became editor-in-chief and so continued until his death, but although it provided him with an organ for disseminating his opinions on science, sociology, religion and government and thus increased his prestige and influence, the *Naturalist* was a constant drain upon his purse and upon his energy, as its publishers were numerous, difficult to manage and expensive.

Cope's two most important contributions to the literature of Evolution were issued independently of the *Naturalist*, the



*Origin of the Fittest* being brought out by Appleton in 1886 and *Primary Factors of Organic Evolution* by the Open Court Publishing Company in 1896.

## LATER YEARS

It being apparent in 1886 that Cope had been swindled out of his patrimony and that something must be done to meet even the modest expenses of his family, he leased his Philadelphia dwelling and moved into the adjoining house which he had previously used as a workroom and storehouse. He merely pitched camp among the bones and manuscripts and set up house-keeping. He began negotiations for the sale of his North American fossil collection and endeavored to secure an appointment as Assistant Secretary of the Smithsonian Institution, but failed. He was, therefore, doubly glad to receive the professorship of geology and mineralogy at the University of Pennsylvania in 1889 and to occupy that position until 1895, when he was transferred to the professorship of zoology and comparative anatomy previously held by Dr. Joseph Leidy.

He went joyously to his work with the Texas Survey in 1892 and 1893, investigating both that state and North Dakota. These were his last Western trips; the remaining three summers of his life were varied only by short trips to eastern caves, such as the Port Kennedy caves in Pennsylvania and the Megalonyx caves in Ohio and Kentucky. The sale of his North American fossil mammalian collection was concluded in 1895 to the American Museum of Natural History, which also later secured the Pampean collection he had bought from Buenos Ayrian scientists in Paris in 1878. Cope hated to part with his North American mammalian more than any other feature of his poverty, but he remained gay and cheerful despite his disappointment and despite the fact that he was beginning to be threateningly ill. In 1896 he was elected to the presidency of the American Association for the Advancement of Science and would have delivered the presidential address in August 1897 had his long-menaced health held out. He fell ill in the spring of 1897 and continued doggedly to attend his classes at the

University, but in April he became really very ill and on the twelfth of that month he died. Shortly before his death he delivered in delirium a brilliant and unified lecture on the *Felidae* and his last conscious sight was of giant bones, piled on every side of his cot. The Quakers, from whose Society Cope had resigned in 1878, came to bury him and to help execute his will, dated October 1, 1895, the principal provisions of which were as follows:

I hereby appoint Jno. B. Garrett of Philadelphia and Henry F. Osborn of New York to be the Executors of this Will. In case of the death of either party, I appoint as substitutes Asa S. Wing of Philadelphia and William B. Scott of Princeton, N. J., the former in place of J. B. Garrett, and the latter in place of H. F. Osborn.

. . . . Of my scientific books I direct that all which they desire shall be taken by the Biological School of the University of Pennsylvania for their library, and the remainder shall be sold and the proceeds divided equally between my wife and daughter.

Of my collections, I direct that all those preserved as wet preparations shall be given to the Academy of Natural Sciences for their museum.

I leave my osteological collections to the School of Biology of the University of Pennsylvania for the use of original investigators primarily, and for use by students when said specimens are not in use by original investigators.

My collection of minerals I present to the University of Pennsylvania to be placed in their general collection. My collection of skins of animals together with the skeleton which accompanies each skin, if any there be, I present to the Academy of Natural Sciences of Philadelphia.

My collection of Fresh water Mollusca I present to the School of Biology of the University of Pennsylvania; the first set of duplicates to go to the Cincinnati Society of Natural History, and the second to the American Museum of Natural History of New York.

My palaeontological collections I divide into three parts. *First*, the North American Collection; *Second*, the South American, i. e., the Pampean Collection which I purchased of the Buenos Ayrian Exhibitors at the Paris Exposition of 1878, and small collections from the West Indies and Mexico; *Third*, European Collections, chiefly from the Miocene of Allier, France. I direct all these to be sold for the benefit of my estate. I advise my executors that these collections have cost me about \$50,000.00. I place no restrictions on them as to the manner of sale except that it may be done as soon as the best advantage indicates.

Of the proceeds of all sales hitherto mentioned in this will, I direct

that my debts shall be paid. . . . The remainder, which I suppose will amount to about \$40,000, I leave to the Academy of Natural Sciences of Philadelphia as an endowment for a professorship or curatorship of Vertebrate palaeontology under the following conditions: Said professor shall be an original investigator of merit who shall be elected by the Council of the Academy and shall have the approval of the U. S. National Academy of Sciences, as an original investigator of merit. His position and services shall be those of a professor as defined in the present by-laws of the Academy: i. e., he shall have entire charge of the material embraced in his department, and the curators shall not interfere with his jurisdiction excepting to see that he does not neglect his duties. Of the income of this sum, \$400 per annum shall be used for the procurement of vertebrate fossils either by collection or by purchase.

The remainder of my real and personal estate I leave to my wife during her lifetime; and after her death to my daughter, Mrs. Julia C. Collins. In case both die, I leave said remainder, one half to my son-in-law, W. C. Collins, and the other half to augment the purchase fund of the chair of vertebrate palaeontology in the Academy of Natural Sciences.

Codicil. March 24th, 1896.

I direct that after my funeral my body shall be presented to the Anthropometric Society and that an autopsy shall be performed on it. My brain shall be preserved in their collection of brains, and my skeleton shall be prepared and preserved in their collections, in a locked case or drawer, and shall not be placed on exhibition, but shall be open to the inspection of students of anthropology. The remainder of my body, I direct, shall be burned and my ashes be preserved in the same place as shall contain the ashes of my esteemed friends, Dr. Jos. Leidy and Dr. Jno. A. Ryder.

#### CONTRIBUTIONS TO GEOLOGY AND STRATIGRAPHY

Inextricably involved in Cope's chosen task of unravelling the problems of life, the structure, functions, development and phylogenetic descent of animals, as well as the broad metaphysical questions which underlie and condition all these problems, were his investigations of geology. These were in his eyes subordinate to palaeontology, but necessary to its proper chronology, consequently he had very little to say concerning structural or dynamic problems of geology and regarded every question in that field from the strictly historical view. Stratigraphy, the determination of limits, distribution, succession and

geological date of the formations in which his fossils were embedded, as well as the correlation of these formations with their equivalents in other parts of the world, constituted his geological occupations; for he could make out the phylogenies of the various animal groups only after he had determined the true chronological order of succession of the genera composing the phyletic series.

When Cope began his studies in the Cretaceous of Kansas in 1871, the whole region was comparatively new and for the most part geologically unexplored; he was, therefore, forced to work out the stratigraphical succession for himself. This was most fortunate, since it made him personally familiar with the strata in which the fossils lay, a rare opportunity for scientists of that day, among them, Leidy, who had worked all his life from bones picked up by chance passersby from the surface of the ground where they had been weathered out of the matrix. Sternberg's method of getting out skeletons and shipping them so far as possible *in situ* had not yet been perfected, so Cope came to geology through palaeontology. Accordingly most of his writings on the subject are scattered through his palaeontological papers and would be very difficult to reassemble, but in the opinion of Professor William Berryman Scott, from whose material this article is prepared, those scattered observations of Cope's were epoch making.

They came, says Professor Scott, at a time when "the haziest ideas were entertained regarding the position and succession of most of the numerous and extensive fresh-water formations, which characterize the western part of the country. It would be an exaggerated claim to say that he had brought order out of the chaos, but it is hardly too much to say that he, more than any other single individual, contributed to this great result. Such was his power of insight that he was occasionally too far ahead of his contemporaries, and only of late have certain of his views received their just meed of appreciation. In some instances, indeed, we are coming back to the opinions which he first promulgated, but which were ignored or rejected at the time.

“Great as his genius undoubtedly was, Cope was not, even as an investigator perfect and free from every fault; to use a Gallicism, he had ‘the defects of his qualities.’ He was so impressed with the immensity of the work to be done, with the necessity of speed, and with the shortness of the time allotted to him, and he was often so carried away by the rushing impetuosity of his thought, that he published no little hasty and ill-considered work. He frequently made blunders that a little more care and consideration would have enabled him to avoid, so eager was he to say what he had to say, and then pass on to the attack of some new problem. To balance this defect, however, he had no tendency to pose as infallible, or to defend errors simply because he had himself committed them. While extremely clear as to his own opinions and the grounds upon which he held them, and while ready to give and take hard knocks in the defense of his views, he was always ready, on good reason being shown, to change those views, and he allowed no weak regard for fancied consistency to hamper the freedom of his thought. . . . Those who are familiar with the vast and desolate regions where the work was done, and who know the great difficulties which the pioneer explorer has to overcome, will view the matter in a very different light and will always regard with admiration the rapidity, clear-sightedness, and skill with which the great complex of fresh-water deposits was marshaled in orderly array, their succession determined, and their equivalences with similar deposits in other parts of the world made out.”

This correlation of the various fossiliferous horizons of North America with those of Europe, made possible by Cope’s wide and accurate knowledge of the successive vertebrate fauna of both continents, was one of his most valuable contributions to geology. Of this Professor Scott wrote in 1897:

“Of late it has become rather the fashion to deprecate as premature all attempts at correlating American and European formations and even to deny the possibility of making such correlations in any trustworthy way. From the strictly geological point of view, such a conservative attitude is natural

enough; but Cope did not regard the question from a purely geological standpoint. He was, above all things, a zoologist, and his principal life work lay in tracing the origins, phylogenies, and relationships of animals, their migrations and geographical distribution, and he clearly saw that such determinations could not be successfully undertaken unless the order of successive appearance of the various animal types in the different continents could first be established. To this end, geological correlations of widely separated deposits are an indispensable necessity, and a false correlation is better as a working hypothesis than none at all, for it sets up a definite thesis in place of vague surmises.

“In several of these determinations of the equivalences between the fresh-water Tertiaries of North America and those of other continents, Cope was a pioneer, and while not all of his correlations have stood the test of fuller knowledge, many of them have only grown stronger with the advance of time and stand out as guide-posts in the further prosecution of the work. For example, his correlations of the Wasatch with the Suessonian of France (in which he followed Marsh), and of the White River with the Oligocene of Ronzon, have been abundantly confirmed by discoveries undreamed of when the equivalences were first suggested. The value of these determinations to the morphological palaeontologist can hardly be overestimated, and every investigator owes a debt of gratitude to Cope for his labors in this department of geology.”

A cursory survey of Cope's work in geology, taken in the order of geological chronology, begins with his single interest in the Permian rocks among the Palaeozoic formations. A controversy about the existence of Permian rocks in the United States had been going on since 1852, when Marcou had reported their presence in Texas and Swallow, Meek and Hayden had confirmed this discovery by finding them in Kansas as well, in 1858. Other authorities disputed this determination and maintained that there was no well-defined Permian rocks in the United States. In 1877 Cope obtained his first specimens of Amphibia and Reptilia from Texas and proceeded to publish a

series of descriptions of extinct vertebrata from the Permian and Triassic Formations of the United States, in which he fully determined the Permian character of rocks in both Texas and Illinois. The researches of I. C. White and Fontaine upon the plants and of C. A. White upon the invertebrates later confirmed Cope's conclusions.

This identification of horizons in regions where they had not previously been known continued in Cope's work in the Triassic, Jurassic and older Cretaceous. Though he neither discovered new formations, nor corrected the reference of those mistakenly placed in the geological columns, he did investigate very thoroughly, especially in the Cretaceous. He was the first to discover Dinosaurian remains in the Laramie stage, and is said to have been the first to recommend the reference of that horizon to the Cretaceous, a radical innovation which was finally adopted by his contemporaries, as it proved its value in giving a fixed point in the obscure formations intervening between the Cretaceous and Tertiary.

In the unravelling of the fresh-water Tertiaries which cover such vast areas of the West lay Cope's most signal service to geology. It is difficult to exaggerate the value of these services according to Professor Scott, who has summed them up, as follows:

"First of all should be mentioned his discovery and identification of the Puerco, or oldest Eocene, which may fairly be called 'epoch-making.' Not only was a very extensive, entirely new and highly significant fauna brought to light, but also the existence of a long time-interval between the Laramie and the Wasatch was demonstrated, showing that the supposed continuity of sedimentation connecting those horizons was illusory. This discovery necessitated an entire change in the views concerning the geological history of the Western region in post-Cretaceous times. The Puerco carried the Eocene much farther back than had been expected, and opened up a new world to the palaeontologist.

"The succeeding Wasatch formation had been discovered and named by Hayden, and its correlation with the Suessonian

of Europe had been pointed out by Marsh, but it is to Cope that we owe much the greater part of our knowledge concerning its distribution, its relations, and its place in the geological column. Personally, or through his collectors, he thoroughly explored the Wasatch of New Mexico and Wyoming, elucidating its fauna with wonderful skill and insight, and strengthening the theory of its close correspondence to the Suessonian of France, with which his studies in that country had made him familiar.

“In the Bridger formation, Cope added very largely to what was known regarding the vertebrate fauna, and established the position of the Wind River beds as forming a substage at the base of the Bridger and making a transition from the older Wasatch to the Bridger proper. He also made a classical series of investigations upon the fishes of the Green River shales, and pointed out the probable equivalence in time of these beds with those of the Wind River substage. He first described the fauna of the Manti beds of Utah of approximately contemporaneous age.”

Hayden and Leidy had very thoroughly examined the White River formation and its very rich vertebrate fauna, and Leidy in his famous monographs had determined these beds as being of Miocene age. Cope challenged this determination and referred the formations rather to Oligocene, stressing the importance of their correspondence with European formations, but the followers of Leidy remained firm adherents of the Miocene determination and considerable confusion resulted. The misleading Miocene determination remained in use for some time, despite Cope's detection of White River beds in North Dakota two hundred miles north of the first discovery and his extension of the range of that formation into the Swift Current region of the Northwestern territory of Canada. Fossils sent him by the Canadian Survey facilitated this latter determination and showed him certain resemblances to the contemporary life of Europe in addition to those which he had detected in the United States.

The Amyzon shales of Nevada and central Oregon and the



Florissant beds of Colorado came under Cope's examination during his preparation of a description of a series of fishes which had been obtained from these formations. He was inclined to consider them of Oligocene or late Eocene age, although somewhat in doubt as to their exact geological date, because of the absence of decisive stratigraphical indication and because fossils common to them and other localities were lacking. In dealing voluminously with the abundant vertebrate fauna of the John Day stage, Cope had little to say regarding its geology beyond that which had been said by his predecessors. In the Loup Fork, however, his observations were original and contrary to precedent.

Leidy had first described the Loup Fork fauna from fossils sent him by explorers and fur traders, who had picked up bones lying on the surface of the ground. These had been weathered out from overlying Pleistocene deposits and were intermixed with too many extinct and peculiar genera to altogether retain their modern classification. Leidy accordingly determined this admixture of fauna as Pliocene, but Cope was suspicious of this reference from the first. When his opportunity of personally examining the Loup Fork beds presented itself, he sought out areas where the strata were at the surface and where no newer overlying formations could falsify his collections. He thus accurately determined the actual elements of the Loup Fork fauna and found them lacking the Pleistocene forms which former casual collections had mistakenly included in them. He came at once to the belief that the Loup Fork beds were not Pliocene at all, but Upper Miocene and extended their area to New Mexico, Texas and the valley of old Mexico. Though considered a great reform in Western stratigraphy by many American geologists this determination was not universally adopted, and while some authorities continued to uphold Leidy's reference confusion prevailed, much to the embarrassment of European writers.

Having determined the fauna as Upper Miocene, Cope proceeded to show that the formation is divisible into two distinct substages. Grinnel and Dana had discovered certain lacustrine

deposits in the valley of the Smith River in central Montana in 1875 and determined them as Pliocene, by which they supposedly meant Loup Fork. Cope sent a collector into this region and from the material gathered showed that these beds which Cope assigned to Nebraska and South Dakota as well as Montana, constituted a substage of the Loup Fork and were older than any part of that formation which had been known up to that time. This determination was of significance in helping to bridge the gap between the John Day and the typical Loup Fork and eventually proved to be of great value in making correlations with the fresh-water deposits of the European Upper Miocene.

The Pliocene of the interior portion of the United States was at this time very vaguely known, but during his studies of the fishes Cope identified certain beds in Idaho and Central Oregon as Pliocene and proposed the name Idaho beds for them. He also was the first to make known the Blanco beds of Texas, describing their stratigraphy, geographical distribution and fossil contents, and thus disclosed one of the most typical and unmistakable of North American fresh-water Pliocenes.

In the Pleistocene, Cope's work consisted in the determination of the successive mammalian faunas and the consequent foundation of the divisions of the North American Pleistocene. This work was thoroughly done in the Sheridan or *Equus* beds of the West and Southwest in widely separated localities, and in the caverns of the East. Notable among these caverns were his early and later investigations of the extensive assemblage of Pleistocene vertebrates in the Port Kennedy bone cave of Pennsylvania, which formed the subject of one of his last publications. The Sheridan beds and the *Megalonyx* beds of the East, he at first considered Pliocene, but eventually changed his opinion and classed them with the Port Kennedy faunas as Pleistocene.

Investigations of the geology and palaeontology of the Atlantic coast, though they formed Cope's first introduction to palaeontology, yielded up such fragmentary and unsatisfactory

material that the results of his labors are less apparent and he remains the geologist, palaeontologist and evolutionist of the Western plains.

CONTRIBUTIONS TO HERPETOLOGY<sup>7</sup>

Cope was a naturalist, not a specialist in one branch of natural history. Herpetology, however, was the first field to interest him and remained one of his chief studies, so that his work in this line ranks with the specialization of many men. The first exhibit of the Museum of the Academy of Natural Sciences at Philadelphia of which the six-year-old boy wrote to his grandmother was the mammal *Hydrarchus* (*Zeuglodon*) then falsely labelled the whale-like lizard. Visiting the Museum a year or so later, he noted in his little journal: "Some saurians which are fossil skeletons that are found in the rocks of England, but it is very curious that they are monstrous sea lizards." In the woods and fields at Fairfield, in the school grounds at Westtown and during summers on the Pennsylvania farms of various cousins, he sought salamanders, snakes and tortoises under roots, stones, fallen trees and layers of leaves and identified his trophies with those described in his father's library or preserved in the Academy Museum.

Just before his fifteenth birthday he wrote to his father, "I caught a large water snake or water wampum, as they are called here—one of the Colubers—in Brandywine and brought it home. It was about as long as my leg, but very thick for its length, . . . I afterwards found it had eaten a large bull frog . . . I soon convinced myself it was not (poisonous) by examining its mouth which wanted fangs, and as all non-venomous have, it had four rows of teeth in its upper, and two in its lower jaw, and two rows of scales under its tail." Throughout his life he collected snakes, toads and salamanders whenever he found a strange species, shipping them home, some

<sup>7</sup> See Theodore Gill, Retiring Presidential Address before the American Association for the Advancement of Science, 1897; also *Proceedings of the American Philosophical Society*, November 12, 1897.

alive and some in alcohol, from the muddy streets of San Antonio, the deserts of New Mexico and the mountains of Nevada and North Carolina. When Cope was nineteen, in 1859, his first formal contribution to scientific literature appeared in the April Proceedings of the Academy of Natural Sciences under title, *On the Primary Divisions of the Salamandridae, with descriptions of Two New Species*. Therein the youthful scientist instituted modifications of the systems previously adopted in the United States.

While still too young to become a member of the Academy, which he joined in 1861 upon coming of age, he occupied several winter months in cataloguing the serpents contained in its Museum and introduced innovations in the systems of classification then in use. He next studied the herpetological collections of the Smithsonian Institution under Spencer F. Baird and then went abroad for his intensive study of the collections of England, France, Austria, Holland and Prussia. His studies covered besides specific details and general taxonomy, the consideration of anatomical details of the reptiles and amphibians, the modifications of general organs, geographical distribution, genetic relations and physiological consequences. For five years his publications were devoted almost exclusively to the reptiles and amphibians and through this channel he entered palaeontology, writing in 1865 his first paper in this field, a description of the stegosaurian amphibian called *Amphibamus grandiceps*, and though the scope of his writings widened thereafter to palaeontology, geology, philosophy and even sociology, he never lost sight of his interest in herpetology nor ceased contributing to it.

Theodore Gill has said of Cope: "*He found Herpetology an art; he left it a science; he found it a device mainly for the naming of specimens; he left it the expression of the co-ordination of all structural features.*" Cope approached herpetological classification boldly and critically surveyed the work of the authorities of the day, Duméril, Bibron and Günther. Where he saw that changes were needed he calmly proposed that they be

made and backed up his suggestions with such sound reasoning that they were adopted.

The anurous amphibians and the saurian reptiles were differentiated in groups, at the time Cope's work began, chiefly on account of superficial characteristics: such as the mode of fixation of the tongue, or its lack; the development of the toes to disklike expansions at the tips, or to simple attenuation; and the presence or absence of teeth. Cope proceeded to investigate the group anatomically and reached new conclusions. He found that important differences existed in the structure of the sternum, especially in the connection of the lateral halves; that in the common tree-toads of Europe and North America the so-called clavicle and coracoid of each side are "connected by a longitudinal arched cartilage which overlaps that of the opposite side" while in the common frogs the clavicles and coracoids of both sides are connected by a single median cartilage. He named the former of these groups, the toads, Arcifers and the latter, frogs, et cetera, Firmisternials and placed the Firmisternials higher in the evolution scale because of their more highly developed shoulder girdle. The development of teeth he first regarded, with his contemporaries, as a very important factor of classification, but later came to subordinate.

Applying his principle of a skeletal basis of classification, Cope dissected the lizards and redistributed them into new divisions, based upon an equation of all skeletal characteristics: such as, structure of the cranium, concordance and variations in the development of bones, structure of the vertebrae, shoulder girdle, teeth, tongue and pholidosis; rather than the previous superficial grouping by tongue form, arrangement of scales, and development of legs and feet. This new method of classification became a matter of bitter correspondence between Cope and the old school herpetologists, but finally won recognition through the sanction of the British Museum catalogues. It crystalized into two volumes which remain, though out-dated, the only comprehensive works on American Herpetology: *The Batrachia of North America*, published in 1889,

and the post-mortem complementary volume, *The Crocodilians, Lizards and Snakes of North America*.

CONTRIBUTIONS TO ICHTHYOLOGY <sup>8</sup>

Cope's contributions to the classification and evolution of the fishes proved to be of such great importance that many of the orders and suborders recognized by him have been adopted by subsequent ichthyologists, especially in America. Beginning with the fresh-water fishes of the Carp family in 1861, he published a series of papers from 1864-1891, including *Partial Catalogue of the Cold-blooded Vertebrata of Michigan*; *Synopsis of the Cyprinidae of Pennsylvania* and *Observations of the Systematic Relations of the Fishes*. Some of the most interesting genera of North American fresh-water fishes were first made known by him (1864-1869). He attempted to arrange them in natural groups and was the first to appreciate the importance of certain characters, such as the structure of the dorsal fin and the relation of the air-bladder to the digestive tract.

His next great series of contributions (1871-1891) dealt with the natural subdivisions of the entire series of fish-like vertebrates. In these papers the following subjects of major interest were dealt with:

- (1) The division of the fishes into classes and subclasses.
- (2) The analysis and reclassification of the old and unnatural group of "ganoids."
- (3) The division of the higher teleosts, or Actinopteri, into no less than twenty-four orders, eight of which survive today.
- (4) The grouping of a series of fresh-water families, including the suckers, carps, loaches, characins, etc., into the order Plectospondyli.
- (5) The breaking up of the old unnatural assemblage of eel-like fishes into several orders and many families.
- (6) The analysis and classification of the Devonian fossil

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<sup>8</sup> Notes by William King Gregory. For a detailed appreciation, see Gill, *Addresses in Memory of Edward Drinker Cope . . . American Philosophical Society*, November 12, 1897.

fishes generally called crossopterygians into a series of orders and suborders.

Cope's contributions to the fresh-water fishes, like his observations on the snakes and lizards, were based at all points on personal observation of the material and an adventurous spirit in the discovery of new and hitherto neglected anatomical characters of possible value as criteria of classification. His studies on the classification and phylogeny of fishes as a whole were based partly upon a large collection of skeletons of fishes from all parts of the world, which he had purchased from Professor Joseph Hyrtl of Vienna.

Cope's influence in the subsequent development of ichthyology was far greater than would appear on the surface because many of his orders and suborders were adopted with slight modifications in the classification of the fossil fishes in the British Museum by Dr. Arthur Smith Woodward.

#### CONTRIBUTIONS TO MAMMALOLOGY

Cope's most numerous and voluminous writings were devoted to mammals, and to appreciate the importance of his contributions in this group it is necessary to cast a brief glance over the history of mammalian palaeontology. Cuvier, the founder of this branch of science, had represented the *école des faits* in opposition to Geoffrey St. Hilaire, and founded a school wholly opposed to generalization as to the origin and succession of animal life, and firmly adherent to the Special Creation hypothesis. As a master of comparative anatomy, Cuvier exerted an immense influence upon the succeeding French palaeontologists, such as Jourdan, Croizet, Christol, De Blainville, Aymard, Lartet and Pomel. It is true that De Blainville and Gervais showed a wide range of knowledge but Gaudry was the first of the French palaeontologists to grasp the spirit of evolution. In Germany, Jager and Blumenbach ranked as more or less voluminous descriptive writers, while Kaup showed superior powers of analysis.

Cuvier's unnatural classification of the hoofed animals into the *Solipcdes*, or horses, and *Pachyderms*, or rhinoceroses and

hippopotami, prevailed and was adopted even by Leidy in this country. Richard Owen, by far the greatest anatomist after Cuvier, made a decided advance, and, as in the classification of the fishes and reptiles, was the direct predecessor of Cope. Partly anticipated by De Blainville, he defined the new mammalian orders, *Marsupialia* and *Toxodontia*, and especially broke down Cuvier's classification of the Ungulates by distinguishing the *Perissodactyla* from the *Artiodactyla* upon the basis of foot structure, the importance of which Cuvier himself had only dimly perceived.

In this country the earlier contributions of Jefferson, Harlan and Gibbes were over-shadowed in the mid-century by the numerous valuable works of Leidy, who became at once the founder of American vertebrate palaeontology, although in deference to the theologic spirit of the times he held in check the philosophical spirit both in anatomy and evolution. Thus, from all this long post-Cuvierian period and immense number of facts, there issued only two generalizations, the first of which may be regarded as the great laws or principles in the evolution and classification of the mammalia. These laws are as follows:

1. *The Law of Brain-Growth*—This principle, that the older mammalia had smaller brains, and that in order of succession there was a steady increase in brain size, was enunciated by Lartet, and has been subsequently elaborated and demonstrated by Marsh.

II. *The Classification of the Hoofed Animals by Foot-Structure*—This was discovered by Owen in his division above alluded to, which first directed attention to the importance of differences in the feet.

The three vertebrate palaeontologists of the new period who responded most fully to the Darwinian movements were Huxley, Marsh and Cope. Huxley unwillingly entered the field, but soon found an opportunity of overthrowing Cuvier's Law of Correlation. His greatest generalization was the central position of the order *Insectivora*. He had, however, few opportunities of working upon fossil mammals; he erroneously placed *Paloplotherium* instead of *Hyracotherium* in the ancestral horse



line, and erroneously supported Reichert's theory of the homology of the quadrate bones. Cope and Marsh alike responded to the Darwinian impulse but along entirely different lines. In Russia appeared Waldemar Kowalevsky, who had a short but brilliant career in mammalian palaeontology. He announced the third great principle:

III. *Law of Adaptation of Foot Structure in Ungulates by Reduction, Accompanied by Shifting of the Metapodials*—Kowalevsky's ancestral type of ungulate or protungulate, like that of Huxley, was believed to possess five digits.

In the meantime the gifted John A. Ryder, of Philadelphia, was attacking the problems of the mechanical evolution of the feet and teeth from the Lamarckian standpoint.

Cope, who had practically entered mammalian palaeontology in 1870, found a great field of facts lying fallow before him, with the three principles outlined above as means of interpretation. Keen to wed philosophy with anatomy, in 1873 he added to the generalizations of Huxley and Kowalevsky the additional principle:

IV. *The Ancestors of the Hoofed Animals Possessed Buno-dont, or hillock-like Teeth*—This prophecy was speedily verified by Wortman's discovery of *Phenacodus*. This discovery led Cope on to a reclassification of the entire group of ungulates by foot-structure—the logical outcome of the movement in which Owen, Huxley, Ryder and himself had participated. This classification centered about the following principle:

V. *The Law of Taxeopody: that the Primitive Feet of Hoofed Animals were Serially Plantigrade, Like those of the Bear, with Serial Unbroken Joints*—Thus he proposed in the early eighties the four new orders, two of which have been permanently adopted into palaeontology: Equivalent to these are three orders proposed by Marsh:

COPE  
*Taxeopoda*, 1882  
*Amblypoda*, 1875  
*Condylarthra*, 1881  
*Diplarthra*, 1883

MARSH  
*Protungulata*, 1884  
*Amblydactyla*, 1884  
*Clinodactyla*, 1884

Kowalevsky, in 1873, had pointed out the significant articulations of the metapodials in the *Artiodactyla*; Cope here showed the still greater importance of the mutual articulations of the podials, firmly establishing thereupon the orders *Condylarthra* and *Amblypoda*, uniting Owen's Perissodactyla and Artiodactyla into the *Diplarthra*, and by hypothetical phyla connecting the Proboscidea and Hyracoidea with a still-to-be-discovered plantigrade, bunodont stem, the "protungulate" of Huxley, Kowalevsky and Marsh. These generalizations despite errors of detail and interpretation which Rutimeyer and Osborn have pointed out, constituted the first distinct advance in mammalian classification since Owen demolished Cuvier's "pachydermata"; they rank with Huxley's best work among similar problems, and afford a basis for the phylogenetic arrangement of the hoofed orders which has been adopted by all American and foreign palaeontologists.

Having thus raised the foot and head, regions of the body so long neglected by the followers of Cuvier (with the exceptions noted), to a position of prime importance in classification, it was his good fortune to discover in the collections from the Puerco or basal Eocene the following law:

VI. *Law of Trituberculy: that all Types of Molar Teeth in Mammals Originate in Modifications of the Tritubercular Form*—It became apparent to him that the hoofed mammals had sprung from clawed ancestors, but the Wasatch period was too remote from the parting of the ways to furnish conclusive evidence. This evidence came in a flood from the underlying Puerco fauna, the systematic evidence of which constitutes the most unique section of Cope's work among the extinct mammalia. From this material originated the above great generalization—namely, that the primitive pattern of the molar tooth consists of three great tubercles, a generalization modified and extended by Osborn, Gregory and others. Around this *trituberculy* center the whole modern morphology of the teeth of the mammalia and the establishment of a series of homologies in the teeth of most diverse types, applying even in the teeth of man. The force and application of the trituber-

cular law Cope clearly perceived, but left to others fully to work out and demonstrate. It promises ultimately to give us the key to the entire phylogeny of the mammalia, extending to every division of the marsupialia and placentalia.

Thus the final philosophical working basis for the evolution of the hoofed, as well as the clawed, animals has been well established, for, as Professor Marsh observes in his monograph on Dinocerata, "the characters of the most importance in the evolution of the Ungulates are the teeth, the brain, and the feet."

It now only remained for Cope to take another step beyond Huxley and Kowalevsky and, aided by fortunate discoveries in the field, he demonstrated that the ancestors of the hoofed animals were clawed animals, establishing the seventh law:

VII. *The Hoofed Orders Arise from the Clawed Types of Creodonta and Insectivora.*

So much for the great generalizations which establish Cope's historical position in mammalian palaeontology. These are the mountain peaks, the points where explorations and discovery were followed by happy inspiration, in a chain of contributions which includes his exposition of the faunal succession of the mammals from the base to the summit of the Tertiary, as well as two or three discoveries of great interest in the Cretaceous. His most conspicuous work relates to the Puerco, with its extremely primitive hoofed and clawed animals and primates. Here he established the existence in this country of the *Plagiaulacidae* and defined the order *Multituberculata*. That from the Wasatch is perhaps next in value, and in succession rank his contributions from the John Day, Loup Fork, Blanco, Palo Duro, and Port Kennedy Bone Cave.

#### COPE AS A FIELD EXPLORER

As an explorer he had marked success, finding the unique skeleton of *Hyrachyus*, of *Loxolophodon*, a name which was telegraphed to the American Philosophical Society, and converted by the operator into *Lefalophodon*. He also found the last of the great race of Uintatheres at the top of Washakie

Mountain of central Wyoming. In the Bridger, Cope himself found the lower jaw of *Anaptomorphus*, a little monkey with a dental formula like that of man, which, owing to its extreme antiquity, occasioned him a greater surprise than any discovery he ever made. We owe to him alone our knowledge of the scanty Wind River fauna. From the White River Oligocene his materials were poor and his work less satisfactory. From the rich Upper Oligocene, with the assistance of Wortman, he secured fine collections and has especially enriched our knowledge of the *Anchitheriidae*, *Felidae* and *Canidae*. From the Upper Miocene, Deep River and Loup Fork beds he has practically originated all that we know, especially of the rhinoceroses, horses, mastodons, camels, and other ruminants and carnivora. Of the latter fauna his most complete papers were upon the evolution of the *Oreodontidae*. His latest contributions to our knowledge of the fossil mammalia were upon the fauna of the Blanco and Palo Duro, or Goodnight beds of Texas, and the rich cave fauna from Port Kennedy, Pennsylvania, brought together by his warm friend, Dr. H. C. Mercer.

The *Tertiary Vertebrata*, Vol. III, of the Hayden quartos, published in 1884, is his most inspiring contribution to palaeontology, including his studies of all the vertebrate fauna of the Tertiary Lakes west of the Rockies. This work of over a thousand pages and seventy-five plates is said to have been the despair of the Public Printer, owing to the constant additions made while in press. It extends from the Puerco to a portion of the lower Miocene fauna. Besides the full description and illustration of the great hoofed orders above alluded to, it contains the full exposition of the characteristic forms of *Creodonta*, an order of primitive Carnivora, which, as we have seen, he separated from the Marsupialia in 1875, and in which he placed six families of mammals from different parts of the world. It will be observed that this volume is entitled "Part I." Cope had in mind a second part which would hardly have been less voluminous. The plates for this part were all prepared and in themselves constituted such an important feature in American palaeontology that at the urgent instance of the present

author, they were finally assembled and ably edited with explanatory legends by Dr. William Diller Matthew. They were published by the American Museum of Natural History in 1916, the volumes being distributed with the cooperation of the U. S. Geological Survey.

Before leaving the mammals it is fitting to speak of his Lamarckian work upon "kinetogenesis," or the mechanical origin of the hard parts of the body, especially the teeth, vertebrae, and limbs. An invaluable paper by his friend and later colleague, Ryder, put him upon this line of investigation, the results of which he published in a long series of papers, culminating in his memoir upon the "Origin of the Hard Parts of the Mammalia" and in his collection of essays upon the "Origin of the Fittest" and "Primary Factors of Organic Evolution." One of his chief motives in these researches was the demonstration, which he believed they afforded, of the hereditary transmission of the effects of individual efforts, use and disuse. Even if this Lamarckian motive is subsequently shown to be an illusive one by our future knowledge of the real nature of evolution, these investigations lose little, if any, of their intrinsic value. First, as in all his work, he brings together an immense array of valuable facts and observations; second, he extends the principle of the independent origin of similar structures; third, he in most cases successfully establishes the actual mechanically adaptive or teleological relations of the parts described; fourth, he traces the course of phylogenetic modification in a number of important organs and thus establishes certain obscure homologies, notably those in the teeth of *Amblypoda*, *Coryphodon* and *Uintatherium*.

#### CONTRIBUTIONS TO ORNITHOLOGY

Cope was an occasional contributor to the literature of ornithology. He was the first to recognize *Laclaps aquilungus* as the probable link between birds and reptiles. He continued to contribute short descriptions of birds from time to time but never became more than an intelligent and well-informed amateur in ornithology. However, a school essay written at

the age of seventeen gives strong indication of an accurate knowledge of the habits of birds and shows that Cope might have developed into a popular bird-man if he had not happened to concentrate his forces in other fields of natural history. In that essay the youth said in part, regarding the Yellow Breasted Chat:

"Often while passing along some retired lane in the country, have I stopped to listen to the singular notes of this bird as they came suddenly upon my ear, like the whistling of the wings of a dove or teal . . . causing me to look up in the expectation of seeing some wild fowl flying off before me. . . . One may readily discover the bird's whereabouts by answering him. . . . He will give you some curious specimens of ventriloquism. His shrill whistle will seem far ahead, when on its ceasing you will be greeted with a note not unlike the half-suppressed croak of an old bull-frog, deep in the thicket beside you; if you stop, he raises his key, almost exactly imitating the call of the partridge, varying it with some deep guttural sounds, much like the barking of young puppies. If you happen to be near his mate and her nest, his anxiety becomes very great; he scolds incessantly, mixing up his whistles and croaks into a most singular jargon of sounds. But if you will sit down on the grass and be right quiet, before long his notes will cease, and if you look carefully under the thicket, you will most likely see him, with his tail up and head down, peering at you with his dark eye, from the lower branch of some sumach. If he finds he is discovered, he becomes more bold and will fly out into the air above your head, where with legs hanging straight down, and tail sticking straight up, he will jerk about, rising pretty high with his short concave wings, and then dropping lower and lower when he glides off into the thicket again. On clear moonlight nights his notes may be heard till long after midnight . . . the country people call him the mocking bird.

"This is perhaps the most difficult bird to shoot that we have. . . . Catesby, an Englishman, who spent some time travelling through the country in the 16th century, in his Natural History of the Colonies, says that he tried his best to obtain specimens himself, but could not, and had to apply to the Indians, who with all their ingenuity found it a difficult matter. . . .

"In size he is somewhat less than the cat bird; the color of his back and wings . . . olive green, and his throat and breast bright yellow. In form he differs from all other birds, excepting an East Indian species with which he is arranged in the genus 'Icteria.' Naturalists differ very widely, as to what family this genus should be referred to. His trivial name, 'polyglotta,' indicates his musical powers."

CONTRIBUTIONS TO PALAEOLOGY<sup>9</sup>

Cope had been diverted from herpetology, as we have seen, by the arrival of *Amphibamus grandiceps* and had swung to an enthusiasm for palaeontology which resulted in his monumental researches, explorations and publications for various State and National Geological Surveys from 1866 until 1897. Beginning in 1866 he was the first to find along the New Jersey coast remains of the leaping dinosaur, *Laeleps aquilunguis*, and he anticipated Huxley in comparing these reptiles with the birds.<sup>10</sup> In 1871 he extended his investigations into the most arid portion of Kansas and there found remains of the ancient marine monsters, the ram-nosed mosasaur, and the sea-serpent or elasmosaur. Following up Custer's army into the Rocky Mountains between the years 1872 and 1878, he discovered in New Mexico, Colorado and Wyoming, the great *Amphicoelias*, the gigantic *Camarasaurus* and the frill-necked *Agathaumas*. In 1877 he received his first fossils from the Permian of Texas and his investigations thereafter revealed a new fauna, rich in species widely different from any previously known.

Working often alone, except for guides, he was obliged to draw his conclusions from fragmentary and imperfect materials and he felt always the necessity of hastening the publication of his findings that he might be the first to herald them. When a bone came into his hands, Professor Cope slowly turned it over and over to thoroughly comprehend its form and to compare it with its nearest ally, then to throw out a conjecture as to its uses and its relation to the life economy of the animal as a whole. He studied the soil and rocks which had entombed the mighty bones, pictured to himself the muscles and nerves which had clothed them and made possible a locomotion to the methods of which the bones themselves bore mute testimony. His mind's eye saw vividly the muddy shores of the

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<sup>9</sup> See, also, Contributions to Mammalogy, Ichthyology, Geology, and Work with Geological Surveys. Also, Osborn, *Impressions of Great Naturalists*.

<sup>10</sup> *Remarks on Extinct Reptiles which approach Birds*, E. D. Cope, *Proc. Acad. Nat. Sci. Phila.* (Vol. XIX) pp. 234, 235. May 11, 1868.

Texas Permian seas where the fin-backed lizards basked, and the great fresh-water expanses of Wyoming and Montana where the dinosaurs wandered. He spoke of these things graphically and today they are visualized in many of our great museums through his inspiration.

#### PHYLOGENY OF THE VERTEBRATA

In reconstructing the history of the animals from their bones, Cope, through his great knowledge of anatomy, was also able to connect the ancient species with their modern descendants and to fill in many gaps both in human and animal ancestry. He was fortunate in finding in northwestern New Mexico by far the oldest quadrupeds known at that time, in finding among these the most venerable monkey then known, in describing to the world hundreds of links in the descent of the horses, camels, tapirs, dogs and cats. He worked out (though these views have been modified by later work) the connection between the amphibians and the reptiles and between the amphibians and the true fish, and he was quick as a flash to detect in the paper of some other author the oversight of some link for which he had long been searching.

His final pronouncement of views concerning the phylogeny of the true fishes, amphibians and reptiles was given in the *Proceedings of the American Philosophical Society* for 1892 (pp. 278-281). The ancestral type of the bony fishes was thought to be "probably the Ichthyomous order of the subclass of sharks (Elasmobranchii)." These he selected because "they are hyostylic, and have cranial segmentation, the basioccipital element being conspicuous. The fins are primitive and those of all other types of fishes might have been derived from them." This view is now being modified by the opinion that much of the simplicity of the sharks is degenerate; the Ichthyotomi are now considered as probably the most primitive of known sharks, but too definitely elasmobranchs to be ancestral to the teleostomes and the two are thought to be of equal antiquity palaeontologically.



There remained some doubt in Cope's mind as to the probable ancestry of the batrachia and he remarked "that it cannot be considered to be yet settled." He was at first a supporter of the Haeckelian belief that they had been derived from the Dipnoi or Dipneusta, but later discarded this theory in favor of Theodore Gill's proposal of the Crossopterygians. He suggested particularly the Rhipidopterygia, in which he included the families of Holoptychiidae, Tristichopteridae, Osteolepididae, Coelacanthidae, "and perhaps some others." The origin of the amphibia is now sought in or near the crossopterygians and the osteolepids are believed to be closest to this ancestry of any known forms.

He was less cautious about the reptiles, which at that time were admittedly differentiated from the amphibian stock, although the exact point of departure remained in obscurity, and concluded that the batrachians which were nearest to the reptiles were the "Emblomeri of the Permian epoch." It is now usually accepted that the Emblomeri among the amphibians are closest to the reptiles, perhaps because this term is used for a grade of structure which appears to be primitive for amphibia, but the origin of reptiles is now sought farther back than the Permian.

As to his scientific attainment in the field of taxonomy or classification, apart from his genius, which is indefinable, we signalize his appreciation of the most significant or diagnostic character in a group. Among his fellow-workers in the same field, whether upon the fishes, amphibians, or mammals, he was quick to comprehend and seize upon a strategic position. While others were plodding on serenely in the description of facts, giving all an equal value, Cope, with an eagle eye, would swoop down upon some great distinctive fact and point out its supreme importance. Thus he projected the mammalian order, *Creodonta*, out of numerous forms, such as *Palaeonictis*, *Hyaenodon*, *Arctocyon*, which had been discovered and studied for many years in France. It is to be regretted that he did not more willingly surrender some of his own hypotheses. He

clung to his erroneous mechanical explanation of the origin of ungulate foot structure long after it had been disproved by the present writer. Like all of us, perhaps, he loved his own hypotheses, and he once observed in jest in regard to a fossil which had opposed one of his theories, "I wish you would throw that bone out of the window."

He was no respecter of authority *per se*. Even if sometimes mistaken, his fearless criticisms were chiefly animated by high ideals and readiness to change the existing order of things. He was full of cheer and determination when things looked most unpromising, allowing nothing to disturb the composure which is so essential to research.

#### CONTRIBUTIONS TO SOCIOLOGY

As the Copes' only child, Julia, grew up her father became interested in the education of women and through that subject in various other sociological problems. He proceeded to publish his opinions. He believed that women, being the mothers of the race and equal contributors to its development, should enjoy opportunities for intellectual development equal to those of men.<sup>11</sup> He sent his daughter to Miss Burnham's School at Northampton, Massachusetts, stipulating that she should study as much science as possible. Later, in 1885, he transferred her studies to the newly-opened Bryn Mawr College where Woodrow Wilson and other recent graduates of the Johns Hopkins University were young professors. He continually admonished his daughter to study, telling her that the best beloved woman was she who combined beauty with intelligence and an informed mind.

That woman of any race, however, is predestined to a physical and mental inferiority to the man of her own race Cope firmly stated; giving the physical disabilities as "inferior muscular strength and child-bearing"; and the mental disabilities as "inferior mental co-ordination, and greater emotional sensibility

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<sup>11</sup> *The Relation of the Sexes to Government*, E. D. Cope. Popular Science Monthly, October, 1888.

which interferes more or less with rational action.” He stated the differences between the sexes as follows:<sup>12</sup>

“The struggle with Nature has given the male of man superior muscular strength and superior rationality. Both have been forced upon him, the first by exertion, the second by experience. Necessity has also compelled him to undergo labor of body and of mind for long continued periods, so that his powers of endurance have been cultivated. Knowing the danger of physical conflict with his kind, he has learned to exercise a certain control of his manners and language. As regards women, their maternal instinct and the care of children have cultivated their affections rather than their rational faculties. Their occupations, although often laborious, have been generally less severe than those of men; hence results their inferior muscular strength, which is from two-thirds to one-half that of a man of the same race and condition. Their affectional nature has led women to cultivate the aesthetic and to excel in the adornment of their persons and their homes. For natural reasons they have become more cleanly than man, more refined, and more attentive to small matters. The general effect of the preponderance of the emotional element in the female mind is to render it more liable to the temporary loss of the coordinate action of its parts, than in the man. This fact is illustrated in the greater ease with which women fall into tears, syncope, hysteria, etc. On the other hand women learn many things with great facility, and are quite as skillful in the use of languages as men.”

Cope opposed woman suffrage, because he regarded man as woman's natural protector and legislator, because he believed the suffrage should be restricted rather than increased in any case, and because he doubted woman's power of becoming a serious economic or political factor. They would vote through emotional suasion either with or against their husbands and lovers, he thought, and similarly in economics, although some women might be successful in business or professional undertakings, even they would be dependent upon capital produced by masculine effort. Woman suffrage he therefore discarded as an unnecessary promoter of family quarrels, of which there were sufficient causes already, and an instigator of sexual

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<sup>12</sup> *The Marriage Problem*, by Prof. E. D. Cope; published from The Open Court of November 15 and 22, 1888, by A. E. Foote, 1223 Belmont Avenue, Philadelphia, 1888.

discord which would react evilly upon the race through the deterioration of feminine attributes.

Regarding marriage Cope was very advanced. He approached the problem almost as a physician approaches the sick, and begged for as calm and unprejudiced a view of the situation as possible. He believed in monogamy as the best economic and psychological adjustment of the biologic problem to civilization. He believed that when monogamy failed two root causes were culpable: mental, spiritual and physical ignorance; and serious divergencies of character and conduct due to ancestry and education. His first reform of the marriage laws concerned unions which involved insane persons, habitual drunkards, and drug addicts: to these when single he would forbid marriage, and when married he would enforce separation "for the all-sufficient reason that such unions cause a great deterioration of the race."

Of normal marriage he remarked: "Eighteen hundred years of Christianity finds us in as great difficulties as ever, but with our sense of justice quickened and our sympathies developed. We have as a basis the fact that most of the white race at least, are capable of a generous and self-sacrificing intersexual passion, which, if treated with reasonable consideration, is of lasting character." Taking this view and the acknowledged failures of the existing system as a starting point, Cope stated his premise: "What is necessary is that matrimonial changes shall be removed from the domain of caprice, and shall be only permitted after a full and fair trial," and expounded his golden mean: the contract marriage. This solution provided for three arbitrarily successive contracts; to have the same value and effect as the existing marriage contract and the same bearing upon support, property and divorce as the laws then prevailing in Pennsylvania, which Cope cited as the most liberal in the country. The time limits of the contracts should increase so as to prevent women of mature age from being deprived of support: the first contract, for previously unmarried persons, should endure for five years and should be renewable only at the desire of both parties; the

second contract should then run for ten or fifteen years and should lapse only at the desire of both parties; the third contract for permanent relations should then be available. In cases of second marriage the longest contract next in order for either party should be obligatory, except in cases where one person had hitherto been unmarried when the previous time contract of the other should be duplicated for the new marriage. Divorce at the expiration of a contract should be granted without publicity, the custody of children being settled as under prevailing laws. A man should be held responsible for the support of his children after divorce, but not of his wife if she be childless. In that case, as her divorce was of her own choosing, she should support herself or be supported by her family.

Throughout the discussion of the marriage problem, education and suffrage, Cope was insistently the biologist, interpreting his sociology by the laws of nature and led to optimism by his belief in evolution. He was an intense Lamarckian and stated in his "*Origin of the Fittest*," "I have learned the connection between the motion of animals and the development of their structure by my studies of palæontology. It is a satisfaction to me to be able to prove the fatherhood of mind or living personality over living nature. It will be the next step to prove that it has been so over dead nature, also. . . . In the proper way and at the proper time mind controls. To find out how this is and when and where, is the great problem of science, also therefore of progress and prosperity."

Cope was a theist in evolution, probably because so long as his orthodox Quaker father lived he was continually requested to reconcile his theories with the religious views in which he had been strictly trained. His affection for his father and his real devotion to a faith, which was after all less troubled by dogma than many sects of his generation, helped him. In fact he justified his early acceptance of the Darwin theory in 1871 as a "Shaker of false faiths and an aid to that which is founded on a rock, that that which cannot be shaken may remain." After his father's death he began to feel that the need of curtailing

his views to avoid controversy and scandal in a small circle was too severe a strain upon his adventurous imagination. He accordingly resigned from the Society of Friends in 1878, but remained a theist in philosophy and a creative evolutionist in scientific theory.

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#### CONCLUSION

The most conspicuous feature of Cope's character from boyhood upward was independence; seldom has a face reflected a character more fully. His square and prominent forehead suggested his vigorous intellect and marvelous memory; his brilliant eyes were the media of exceptional keenness of observation; his prominent chin was in traditional harmony with his aggressive spirit. From this rare combination of qualities so essential to free investigation sprang his scientific genius.

Appreciation of greatness is a mark of the civilization and culture of a people. Cope's monumental work, preserved in thousands of notes, short papers, and memoirs, and in three bulky government quartos, constitutes his assurance of enduring fame. Some of his countrymen, and even of his fellow-workers, allowed certain of his characteristics to obscure his stronger side in their estimate of him and his works, and during his life he received few of the honors such as foreigners are wont to bestow upon their countrymen of note. When we think more deeply of what really underlies human progress, we realize that only to a few men with the light of genius is it given to push the world's human thought along, and that Edward Drinker Cope was one of these men.

We may contrast three great Academicians: Joseph Leidy, Edward Drinker Cope and Othniel Charles Marsh. Whereas in Leidy we had a man of the exact observer type, Cope was a man who loved speculation. If Leidy was the natural successor of Cuvier, Cope was the natural successor of Lamarck. Leidy, in his contributions to the academy, covered the whole world of nature, from the Protozoa and Infusoria up to man, and he

lived as the last great naturalist in the world of the old type who was able by both capacity and training to cover the whole field of nature. Cope, in contrast, mastered—and this mastery in itself was a wonderful achievement—the entire domain of vertebrates from the fishes up. Marsh, with less breadth and less ability, nevertheless was a palaeontologist of a very high order and had a genius for appreciating what might be called the most important thing in science. He always knew where to explore, where to seek the transition stages, and he never lost the opportunity to point out at the earliest possible moment the most significant fact to be discovered and disseminated.

It is most interesting to contrast the temperament of these three men, Joseph Leidy, Edward Drinker Cope and Othniel Charles Marsh. They were as different as any three men could possibly be made, both by nature and nurture. As Professor Edward Smith said, in one of his addresses on Leidy, “scientists are only mortals after all.” Your scientific genius may hitch up with a star on one hand and with an anchor on the other. Whereas Leidy was essentially a man of peace, Cope was what might be called a militant palaeontologist; whereas Leidy’s motto was peace at any price, Cope’s was war whatever it cost. I do not know that I can find from Shakespeare any characterization of Joseph Leidy, but I think in *Henry IV* there is a very apt characterization of my friend Edward D. Cope:

I am not yet of Percy’s mind, the Hotspur of the north; he that kills me some six or seven dozen of Scots at a breakfast, washes his hands and says to his wife, “Fie upon this quiet life! I want work.”

Perhaps there was a scientific providence in all this; perhaps such antagonistic spirits were necessary to enliven and disseminate interest in this branch of science throughout the country. The subtle combative quality in a palaeontologist is a strange quality; it is a strange inversion, because the more ancient and difficult the study, the more refractory the fossil, the greater the animation of discussion regarding its relationships. From this subtle ferment there arose the famous rivalry which existed not between Leidy and either of the others, because it was impossible to quarrel with Leidy, but between Cope, the descendant of a Quaker family, and Marsh the nephew of a great philan-

thropist. This rivalry was tonic to Cope and although in his eagerness to publish his discoveries and theories before Marsh could produce similar material he made careless mistakes, still "the scowl of his foe" (Marsh) remained, as in the Celtic poem, "the sun which caused him to grow."



# Bibliography of Edward Drinker Cope

1859-1915

BY HENRY FAIRFIELD OSBORN AND ASSISTANTS

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## INTRODUCTION

This bibliography has been rearranged from the manuscript copy of a "Bibliography of the Published Writings of Edward Drinker Cope, 1859-1899," by Anna M. Brown.

In the revision material from the bibliography included in Dr. O. P. Hay's "Bibliography and Catalogue of the Fossil Vertebrata of North America,"<sup>1</sup> and Persifor Frazer's "Catalogue chronologique des publications de Edward Drinker Cope"<sup>2</sup> has been incorporated. Indebtedness must also be acknowledged to Mr. F. W. Ashley of the Library of Congress, to Dr. Witmer Stone of the Academy of Natural Sciences of Philadelphia, to Dr. W. P. Wilson of the Commercial Museum, Philadelphia, to Mr. John Ashurst of the Free Library of Philadelphia, and to Mr. Charles W. Johnson of the Boston Society of Natural History who have most kindly helped both to verify and to locate references.

In the arrangement of the titles an effort has been made to keep to the following rules:

### I. Dates

A. So far as can be ascertained the titles are arranged in chronological sequence in accordance with their respective dates of publication.

1. Dates of publication are taken from

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<sup>1</sup> Bibliography and Catalogue of the Fossil Vertebrata of North America. *Bull. U. S. Geol. Survey*, No. 179, 1902.

<sup>2</sup> Catalogue chronologique des publications de Edward Drinker Cope . . . *Extrait, Annales Soc. géol. de Belgique*, t. XXIX, Bibliographie, pp. BB3-BB77. Liège, 1902.

- a. Dates on the brochures.
  - b. Dates published by the Academy of Natural Sciences of Philadelphia in "Index to the Scientific Contents of the Journal and Proceedings of the Academy of Natural Sciences of Philadelphia. Published in Commemoration of the Centenary of the Academy, March 21, 1912."
  - c. Dates of acknowledgment for the various parts of the publications of the American Philosophical Society as published in their Proceedings.
- B. In cases where an article has appeared in instalments covering two or more months the *date of the first instalment* has been adopted.
  - C. When no date of publication could be found
    - 1. Verbal communications were listed under the dates of the proceedings.
    - 2. Volumes were placed at the beginning of the year.
    - 3. Those titles having the month but not the day of publication were placed at the beginning of the month.
  - D. Dates following volumes are those of the year in which the verbal proceedings were held. When there is a discrepancy between this date and the one selected as the index date, the latter is, to the best of belief, that of actual publication.
  - E. An abstract of an article appearing previous to the publication of the full article is separately listed. (See, II C.)
  - F. Titles found in the manuscript but impossible to locate and undated manuscripts of Cope's have been placed together, without numbers, at the beginning of the bibliography.
- II. Titles
- A. Published titles stand as printed save for uniformity of capitalization.
  - B. Verbal communications and untitled editorials are titled as follows:
    - 1. According to the titles published in the indices of the volumes, except in cases where the title failed to agree with the subject of the communication.
    - 2. According to some title published later as in the "Index" of the Academy.
    - 3. By supplying a title enclosed in ( ), using in almost all cases those in Miss Brown's bibliography.
  - C. Titles of abstracts, when changed from but of *later date of publication* than the original are indicated under the original article.
- III. Abbreviations
- A. The titles of all publications are abbreviated in accordance with the schemes most commonly used.

- e. g.* Amer. Journ. Sci.—American Journal of Science  
 Amer. Nat.—American Naturalist  
 Ann. & Mag. Nat. Hist.—Annals and Magazine of Natural History  
 Bull. U. S. Nat. Museum.—Bulletin of the United States National Museum  
 Bull. Geol. Soc. Amer.—Bulletin of the Geological Society of America  
 Journ. Acad. Nat. Sci. Phila.—Journal of the Academy of Natural Sciences of Philadelphia  
 Lippincott's Mag.—Lippincott's Magazine  
 Nat. Hist. Rev.—Natural History Review (published in London)  
 Pal. Bull.—Paleontological Bulletin  
 Proc. A. A. A. S.—Proceedings of the American Association for the Advancement of Science  
 Proc. Acad. Nat. Sci. Phila.—Proceedings of the Academy of Natural Sciences of Philadelphia  
 Proc. Amer. Philos. Soc.—Proceedings of the American Philosophical Society  
 Proc. U. S. Nat. Museum—Proceedings of the United States National Museum  
 Proc. Boston Soc. Nat. Hist.—Proceedings of the Boston Society of Natural History  
 Proc. Zool. Soc.—Proceedings of the Zoological Society of London  
 Smithsonian Contrib. to Knowledge—Smithsonian Contributions to Knowledge  
 Southern Mag.—Southern Magazine  
 Trans. Acad. Nat. Sci. Phila.—Transactions of the Academy of Natural Sciences of Philadelphia  
 Trans. Amer. Entomol. Soc.—Transactions of the American Entomological Society  
 Trans. Amer. Philos. Soc.—Transactions of the American Philosophical Society.  
 Zool. Anz.—Zoologischer Anzeiger
1. In cases such as the Annals and Magazine of Natural History and the American Journal of Science where the title of the publication has undergone change the title now in use is the one chosen throughout the bibliography.
- B. Miscellaneous abbreviations
1. (Hay) means that the preceding note or succeeding title is quoted in Hay's "Bibliography and Catalogue of the Fossil Vertebrata of North America."
  2. \* means not personally seen

## TITLES OF E. D. COPE, NOT DISCOVERED, JULY 1, 1921

Some Points in the Zoology and Geology of Glycaphuati, by Robert Ramrod, A. E. C.

A Satire on the Philadelphia Academy. Evidently seen by Persifor Frazer since it is quoted by him in the *American Geologist*, Vol. 26, 1900, pp. 70, 71. No trace could be found.

## ORGANIC MATTER

Supposed to be in the *New Review* (Philadelphia), Vol. I, No. 3, Sept. 19, 1895, pp. 20, 21. Not in the publication.

## BIOLOGY

Supposed to be in the *New Review* (Philadelphia), Vol. II, No. 1, 1896, p. 212. Not in the publication.

A Bibliography of the Chelonia (MSS.). Now in possession of the Osborn Library of Vertebrate Paleontology.

A collected volume of manuscript. Contents: Catalogue of Reptilia of the Upper Amazon.

## BIBLIOGRAPHY

- 1859.1      On the Primary Divisions of the Salamandridæ, with Descriptions of Two New Species. *Proc. Acad. Nat. Sci. Phila.*  
 April      Vol. XI, 1859, pp. 122-128.  
 26      An annotated synopsis of the subfamilies and genera with descriptions of the new species *Amblystoma conspersum* and *Desmognathus ochrophaca* from Pennsylvania.
- 1860.2      Notes and Descriptions of Foreign Reptiles. *Proc. Acad. Nat. Sci. Phila.* Vol. XI, 1859, pp. 294-297.  
 Jan.      Tortoises and a crocodile from West Africa, including the new genus *Heptathyra* of the former and a new genus of snake, *Olisthenes*, from South America.  
 12      .
- .3      Catalogue of the Venomous Serpents in the Museum of the Academy of Natural Sciences of Philadelphia, with Notes on the families, genera and species. *Proc. Acad. Nat. Sci. Phila.* Vol. XI, 1859, pp. 332-347.  
 March      30
- .4      Supplement to "A Catalogue of the Venomous Serpents in the Museum of the Academy of Natural Sciences of Philadelphia." *Proc. Acad. Nat. Sci. Phila.* Vol. XII, 1860, pp. 72-74.  
 April      13

- With a key to the genus *Elaps*, and a description of a new species, *Elaps melanogenys*.
- .5  
April 13 Catalogue of the Colubridæ in the Museum of the Academy of Natural Sciences of Philadelphia. Part I. Calamarinæ. *Proc. Acad. Nat. Sci. Phila.* Vol. XII, 1860, pp. 74-79.  
Including description of the new genus *Tropidoclonion* and several new species.
- .6  
Nov. 15 Catalogue of the Colubridæ in the Museum of the Academy of Natural Sciences of Philadelphia, with Notes and Descriptions of New Species. Part II. *Proc. Acad. Nat. Sci. Phila.* Vol. XII, 1860, pp. 241-266.  
Describing the new genera *Pariaspis*, *Cemophora*, *Hypsiglena*, *Coniophanes* Hallowell MSS., *Pliocerus* and *Eumesodon*.
- .7  
Nov. 15 Notes and Descriptions of New and Little Known Species of American Reptiles. *Proc. Acad. Nat. Sci. Phila.* Vol. XII, 1860, pp. 339-345.  
Mostly from the Xantus collection from Lower California. A new genus of snake, *Chilomeniscus*, is described from that peninsula.
- .8  
Dec. An Enumeration of the Genera and Species of Rattlesnakes, with Synonymy and References. *Smithsonian Contrib. to Knowledge*, Vol. XII, 1860, Art. VI, Appendix A, pp. 119-126.  
Including the first mention, from MSS. (without description), of Kennicott's *Crotalus lepidus*.
- 1861.9  
Jan. 18 Descriptions of Reptiles from Tropical America and Asia. *Proc. Acad. Nat. Sci. Phila.* Vol. XII, 1860, pp. 368-374.  
Including the new family *Adenomida* and genus *Adenomus* from Ceylon, the new skink, *Siderolampus* from Mexico and the new snake genus *Amastridium* from New Granada (Colombia).
- .10  
Jan. 18 Report upon the Reptiles of the North Pacific Exploring Expedition under Command of Capt. John Rogers, U. S. N., by Edward Hallowell (E. D. Cope, editor). *Proc. Acad. Nat. Sci. Phila.* Vol. XII, 1860, pp. 480-510.  
Collections of reptiles and amphibians from Nicaragua, California, Oceania (Hawaiian Islands), New Holland (Australia), Loo-Choo, Japan, China, Java, Cape of Good Hope, and Madeira, with an index of species.
- .11  
March 31 Descriptions of New Species of the Reptilian Genera *Hyperolius*, *Liuperus* and *Tropidodipsas*. *Proc. Acad. Nat. Sci. Phila.* Vol. XII, 1860, pp. 517, 518.  
From Liberia, Buenos Aires and Honduras, respectively.

- .12 List of the recent species of Emydosaurian Reptiles in the  
March Museum of the Academy of Natural Sciences. *Proc. Acad.*  
31 *Nat. Sci. Phila.* Vol. XII, 1860, pp. 549, 550.  
With descriptions of a new genus *Osteolaemus* of the  
*Crocodylidae* from West Africa, and a new snake, *Mecistops*  
*bathyrhynchus* of unknown locality.
- .13 Catalogue of the Colubridæ in the Museum of the Academy  
March of Natural Sciences of Philadelphia. Part III. *Proc. Acad.*  
31 *Nat. Sci. Phila.* Vol. XII, 1860, pp. 553-566.  
Including descriptions of the new genera *Prymnomidon*  
from Siam and *Zaocys* from Ningpo, China.
- .14 Remarks on Reptiles (Changes in Nomenclature: Species of  
June *Tantilla*: Specific Characters of *Lepidosternum floridanum*).  
30 *Proc. Acad. Nat. Sci. Phila.* Vol. XIII, 1861, pp. 73-75.  
Gives a synopsis of the genus *Tantilla*.
- .15 Remarks on Reptiles (*Diphalus*: *Amphisbaena angustifrons*:  
June *Loxocemus* Cope). *Proc. Acad. Nat. Sci. Phila.* Vol. XIII,  
30 1861, pp. 75-77.  
West Indies, Buenos Aires and San Salvador.
- .16 On an Iguana from Andros Island. *Proc. Acad. Nat. Sci.*  
Sept. *Phila.* Vol. XIII, 1861, p. 123.  
30 *Cyclura baculopha* Cope.
- .17 On *Amblystoma* from Chester Co., Pennsylvania. *Proc.*  
Sept. *Acad. Nat. Sci. Phila.* Vol. XIII, 1861, pp. 123, 124.  
30 A new species of *Amblystoma*, *Amblystoma microstomum*,  
from Ohio.
- .18 Notes and Descriptions of Anoles. *Proc. Acad. Nat. Sci.*  
*Phila.* Vol. XIII, 1861, pp. 208-215.  
The Academy of Natural Sciences of Philadelphia acknowl-  
edges no month for this signature. A preliminary paper on  
the anoline Squamidæ mostly from Cuba.
- .19 Contributions to the Ophiology of Lower California, Mexico  
Dec. and Central America. *Proc. Acad. Nat. Sci. Phila.* Vol.  
28 XIII, 1861, pp. 292-306.  
With some general remarks on distribution and the divid-  
ing line between the neotropical and nearctic groups of faunæ.
- .20 On the Reptiles of Sombrero and Bermuda. *Proc. Acad.*  
Dec. *Nat. Sci. Phila.* Vol. XIII, 1861, pp. 312-314.  
28 A description of two new species *Ameiva corvina* and  
*Plestiodon longirostris*.

- 1862.21 On the Genera *Panolopus*, *Centropyx*, *Aristelliger* and *Sphaerodactylus*. *Proc. Acad. Nat. Sci. Phila.* Vol. XIII, 1861, pp. 494-500.  
 March 31 With a synopsis of species.
- .22 Observations upon certain Cyprinoid Fish in Pennsylvania. *Proc. Acad. Nat. Sci. Phila.* Vol. XIII, 1861, pp. 522-524.  
 March 31 *Chrosomus eos* and *Leucosomus routhius* (*Cyprinella analostana* Gerard of Potomac basin) found in Susquehanna basin.
- .23 On *Elapomorphus*, *Sympholis*, and *Coniophanes*. *Proc. Acad. Nat. Sci. Phila.* Vol. XIII, 1861, p. 524.  
 March 31 Dividing *Elapomorphus* into three genera *E.*, *Phalotris* and *Apostolepis*. Specimens described from Paraguay and Guadalupe, Mexico.
- .24 On the Dentition of *Herpeton tentaculatum*, and on the Habitat of *Gerarda prevostiana* and *Rhabdosoma lineatum*. *Proc. Acad. Nat. Sci. Phila.* Vol. XIV, 1862, p. 1.  
 April 25 From Siam, Philippine Islands (?) and Trinidad, respectively.
- .25 Synopsis of the Species of *Holcosus* and *Amevia*, with Diagnoses of new West Indian and South American Colubridæ. *Proc. Acad. Nat. Sci. Phila.* Vol. XIV, 1862, pp. 60-82.  
 April 25 The H. and A. from West Indies, Central and South America.
- .26 On some New and Little Known American Anura. *Proc. Acad. Nat. Sci. Phila.* Vol. XIV, 1862, pp. 151-159.  
 April 25 From Cuba, New Providence Isl., St. Thomas, New Grenada (Colombia), Paraguay, Panama and Nicaragua.
- .27 Contributions to Neotropical Saurology. *Proc. Acad. Nat. Sci. Phila.* Vol. XIV, 1862, pp. 176-188.  
 The Academy of Natural Sciences acknowledges no date (month or day) for these pages. See the "Index," p. xiii. From New Grenada (Colombia), Paraguay, Central America and the West Indies. With a synopsis of the skink genus *Mabuia*.
- .28 On *Neosorex albibarbis*. *Proc. Acad. Nat. Sci. Phila.* Vol. XIV, 1862, pp. 188, 189.  
 The Academy of Natural Sciences acknowledges no date (month or day) for these pages. See the "Index," p. xiii.
- .29 On *Lacerta echinata* and *Tiliqua dura*. *Proc. Acad. Nat. Sci. Phila.* Vol. XIV, 1862, pp. 189-191.  
 The Academy of Natural Sciences acknowledges no date

- (month or day) for these pages. See "Index," p. xiii. Both from West Africa. Other additions to the "Catalogues of West African reptiles recently published by Drs. Gray and Duméril."
- .30 On *Carphotis harpesti*. *Proc. Acad. Nat. Sci. Phila.* Vol. XIV, 1862, p. 249.  
The Academy of Natural Sciences acknowledges no date (month or day) for these pages. See the "Index," p. xiii. A specimen of this Dum. and Bib. species discovered in Texas is placed in the genus *Virginia*.
- .31 Notes upon some Reptiles of the Old World. *Proc. Acad. Nat. Sci. Phila.* Vol. XIV, 1862, pp. 337-344.  
Oct. 28
- .32 On a Cuban Bufanoid: *Peltaphryne empusa*. *Proc. Acad. Nat. Sci. Phila.* Vol. XIV, 1862, p. 344.  
Oct. 28 First characterization of this genus.
- .33 Catalogue of the Reptiles obtained during the Explorations of the Parana, Paraguay, Vermejo and Uruguay Rivers, by Capt. Thos. J. Page, U. S. N.; and of those procured by Lieut. N. Michler, U. S. Top. Eng., Commander of the Expedition conducting the Survey of the Atrato River. *Proc. Acad. Nat. Sci. Phila.* Vol. XIV, 1862, pp. 346-359.  
Oct. 28 With a synopsis of the Bufonidæ.
- 1863.34 On *Trachycephalus* and on South American Batrachia. *Proc. Acad. Nat. Sci. Phila.* Vol. XV, 1863, p. 26.  
April 3 *Corneous* thickening on interior metatarsus of *Trachycephalus* during breeding season. Manubrium sterni present in certain South American Bufones.
- .35 On Part II of Prof. G. Jan's *Prodromo della Iconografia Generale degli Ofidi*. [Review]. *Amer. Journ. Sci.*, 2d Ser. Vol. XXXV, 1863, pp. 455-458.  
May Discussion and corrections on Calamaridæ and a new synopsis of the Probletorhinidæ.
- .36 On *Hololepis simus*. *Proc. Acad. Nat. Sci. Phila.* Vol. XV, 1863, p. 42.  
June 8 New species from Cedar Swamps, New Jersey.
- .37 On *Trachycephalus*, *Scaphiopus* and other American Batrachia. *Proc. Acad. Nat. Sci. Phila.* Vol. XV, 1863, pp. 43-54.  
June 8 Mostly from Tropical America. Synopses of *Trachycephalus* and *Scaphiopus*.



- .38 On a Species of *Vipera* hitherto unknown. *Proc. Zool. Soc.*  
 June 1863, pp. 229, 230, one figure. (Reprinted, *Ann. & Mag.*  
 9 *Nat. Hist.*, 3d. Ser., Vol. XIII, 1864, pp. 181, 182, one  
 figure).  
*V. confluenta.*
- .39 Descriptions of new American Squamata, in the Museum of  
 July the Smithsonian Institution, Washington. *Proc. Acad. Nat.*  
 13 *Sci. Phila.* Vol. XV, 1863, pp. 100-106.  
 Mostly from Tropical America including several of *Xantus'*  
 specimens from Cape St. Lucas, Lower California.
- 1864.40 Contributions to the Herpetology of Tropical America. *Proc.*  
 Sept. *Acad. Nat. Sci. Phila.* Vol. XVI, 1864, pp. 166-181.  
 30
- .41 On the Limits and Relations of the Raniformes. *Proc. Acad.*  
 Sept. *Nat. Sci. Phila.* Vol. XVI, 1864, pp. 181-183.  
 30
- .42 On the Characters of the Higher Groups of Reptilia Squa-  
 Sept. mata—and especially of the *Diploglossa*. *Proc. Acad. Nat.*  
 30 *Sci. Phila.* Vol. XVI, 1864, pp. 224-231.
- .43 On a Blind Silurid, from Pennsylvania. *Proc. Acad. Nat.*  
 Sept. *Sci. Phila.* Vol. XVI, 1864, pp. 231-233.  
 30 *Gronias nigrilabris* Cope N. Sp. with rudimentary eyes, and  
*Ethostoma peltatum* Stauffer N. Sp., from Conestoga Creek,  
 Lancaster Co., Pa. *Pæcilichthys mesæus* Cope N. Sp. from  
 Platte River, Fort Kearney, Neb.
- 1865.44 Sketch of the Primary Groups of *Batrachia salientia*. *Nat.*  
 Jan. *Hist. Rev.* (London), Vol. V, 1865, pp. 97-120.  
 ?
- .45 Partial Catalogue of the Cold-Blooded Vertebrata of Mich-  
 Feb. igan. *Proc. Acad. Nat. Sci. Phila.* Vol. XVI, 1864, pp.  
 13 276-285.  
 From collections of the Flint Scientific Institute, the State  
 Agricultural College. Several new species. Several speci-  
 mens from Pennsylvania and Kansas discussed in footnotes.
- .46 Partial Catalogue of the Cold-Blooded Vertebrata of Mich-  
 Aug. igan. Part II. *Proc. Acad. Nat. Sci. Phila.* Vol. XVII,  
 7 1865, pp. 78-88.  
 Continuation of preceding. Several new species described  
 in footnotes. On p. 85 "Note on fishes brought from Platte  
 River, near Fort Riley, by Dr. Wm. A. Hammond." On pp.  
 87-88 "Supplementary note on a peculiar genus of Cyprinidæ—  
*Ericymba buccata* Cope, N. G. et Sp."

- .47 On *Amphibamus grandiceps*, a new Batrachian from the Coal  
 Oct. Measures. *Proc. Acad. Nat. Sci. Phila.* Vol. XVII, 1865,  
 16 pp. 134-137.
- This is Cope's first palaeontological contribution. Moodie remarks,<sup>39</sup> "The publication of the type species of this genus began the researches of Professor Cope on the extinct amphibia of North America, which he continued for so many years with such excellent results. The description was based on a single specimen, belonging to Mr. Joseph Evans of Morris, Illinois, who loaned it to Dr. Worthen for the Illinois Geological State Survey, in order that it might be described. The type has been destroyed by fire; so I am informed by Mr. L. E. Daniels of Rolling Prairie, Indiana. There are two other known specimens of the species. One is in the collection of Mr. Daniels, and the other No. 794 of the Yale University Museum." The genus is an important one among fossil amphibia and is made by Dr. Moodie the type of a distinct family.
- .48 Note on a Species of Whale occurring on the Coasts of the  
 Oct. United States (Title given in Index for Vol. XVII, as follows: Note on a Species of Whale caught in the River Delaware). (*Balæna cisarctica*.) *Proc. Acad. Nat. Sci. Phila.* Vol. XVII, 1865, pp. 168, 169.
- .49 Note on a Species of Hunchback Whale. *Proc. Acad. Nat. Sci. Phila.* Vol. XVII, 1865, pp. 178-181.  
 Dec. 26 *Megaptera osphyia*.
- .50 Third Contribution to the Herpetology of Tropical America.  
 Dec. [Frazer (1902) added to this title the following sub-title:—  
 26 With a Synopsis of the Genera *Hylidæ*.] *Proc. Acad. Nat. Sci. Phila.* Vol. XVII, 1865, pp. 185-198.
- With a list of species sent by Dr. Sartorius to the Smithsonian Institution from near Vera Cruz and the table-land and southern mountains of Mexico. Also a synopsis of the genera of *Hylidæ*.
- .51 A Contribution to a Knowledge of the *Delphinidæ*. *Proc. Acad. Nat. Sci. Phila.* Vol. XVII, 1865, pp. 198-204.  
 Dec. 26
- 1866.52 Supplement to the Description of Vertebrates. *Geological Survey of Illinois*, A. H. Worthen, Director, Vol. II, 1866, pp. 135-141, Pl. XXXII and I woodcut.
- Amphibamus grandiceps* redescribed and figured. See 47.

<sup>39</sup>Moodie, R. L., 1916, The Coal Measures Amphibia of North America. Carnegie Institution Publication No. 238, p. 126.

- .53 Observations on the Skeleton of a Seal, and on the Crania of Cetaceans of the United States Coast, with Remarks on the Species of the Latter. *Proc. Acad. Nat. Sci. Phila.* Vol. XVII, 1865, pp. 273, 274.  
 The original, verbal communication, is not indexed. The title was given by Frazer (1902), but in the Index of the Academy (1913) the title is given as: On a Species of Seal and on Cetaceans. No date of publication acknowledged by the Academy of Natural Sciences, see, "Index," p. xiii. It seems obvious that the more likely date for this signature is early in 1866, since the preceding signature was dated December 26, 1865, and the subsequent signature for the earliest part of Vol. XVIII is acknowledged June 11, 1866.
- .54 Observations on the Geographical Distribution of Some Fresh-water Fishes. *Proc. Acad. Nat. Sci. Phila.* Vol. XVII, 1865, p. 274.  
 No date of publication acknowledged by the Academy of Natural Sciences. See 53, note. Untitled verbal communication. Present title given by Frazer (1902). Changed in the Index (1913) to: On Geographical Distribution of Certain Fishes. Contrast in fish faunas of Coastal Plain and Piedmont of Atlantic Slope of U. S.
- .55 Second Contribution to a History of the Delphinidæ. *Proc. Acad. Nat. Sci. Phila.* Vol. XVII, 1865, pp. 278-281.  
 No date of publication acknowledged by the Academy of Natural Sciences. See 53, note.
- .56 Remarks on a Species of Nautilus, *Aturia*, from the New  
 June Jersey Cretaceous. *Proc. Acad. Nat. Sci. Phila.* Vol.  
 11 XVIII, 1866, pp. 3, 4.  
 Title in Index: On an *Aturia* from the Marl of New Jersey.
- .57 Description of the cranium of a Black-Fish from Delaware  
 June Bay. *Proc. Acad. Nat. Sci. Phila.* Vol. XVIII, 1866, pp.  
 11 7, 8.  
 (*Globicephalus*.)
- .58 On the Structures and Distribution of the Genera of the  
 July Arciferous Anura. *Journ. Acad. Nat. Sci. Phila.*, Ser. 2,  
 Vol. VI, 1866, pp. 67-112, Pl. XXV. (Separates, July, 1866.)
- .59 Fourth Contribution to the Herpetology of Tropical America.  
*Proc. Acad. Nat. Sci. Phila.* Vol. XVIII, 1866, pp. 123-132.  
 No date acknowledged by the Academy of Natural Sciences. See "Index," p. xiii. With descriptions of the new lacertilian genus *Cachryr*, and *Colostethus* of the Ranidæ.

- .60 On Some Vertebrates from the Mesozoic Red Sandstone. *Proc. Acad. Nat. Sci. Phila.* Vol. XVIII, 1866, pp. 249, 250.  
No date acknowledged by the Academy. See "Index," p. xiii. Phoenixville, Pa., fossils. Description of *Mastodonsaurus durus* (= *Eupelor durus*).
- .61 Remarks on the Remains of a Gigantic Extinct Dinosaur from the Cretaceous Greensand of New Jersey. *Proc. Acad. Nat. Sci. Phila.* Vol. XVIII, 1866, pp. 275-279.  
No date acknowledged by the Academy. See "Index," p. xiii. Description of *Laelaps aquilunguis*.
- 1867.62 Remarks on the Geological Horizon of the Mesozoic Sandstone of Pennsylvania. *Proc. Acad. Nat. Sci. Phila.* Vol. XVIII, 1866, p. 290.  
Feb. 13 *Pterodactylus longispinis* from Pa. Trias. No description.
- .63 Third Contribution to the History of the Balaenidæ and Delphinidæ. *Proc. Acad. Nat. Sci. Phila.* Vol. XVIII, 1866, pp. 293-300.  
Feb. 13 Remarks on eight species, five of them new.
- .64 On the Reptilia and Batrachia of the Sonoran Province of the Nearctic Region. *Proc. Acad. Nat. Sci. Phila.* Vol. XVIII, 1866, pp. 300-314.  
Feb. 13 *Hyla curta* Cope. On a collection made along the Mexican border by Dr. Coues, and others. General discussion of the distribution of species in the Sonora province. Includes a synopsis of the genus *Caudisoma* (*Crotalus*).
- .65 On Anatomical Peculiarities in Some Dinosauria. *Proc. Acad. Nat. Sci. Phila.* Vol. XVIII, 1866, pp. 316, 317. (Title in Index: On *Laelaps*.)  
Feb. 13 Relations of tibia and fibula in *Laelaps*.
- .66 Fifth Contribution to the Herpetology of Tropical America. *Proc. Acad. Nat. Sci. Phila.* Vol. XVIII, 1866, pp. 317-323.  
Feb. 13 New species and a new genus of snakes, *Mesopeltis*, all from Mexico.
- .67 The Fossil Reptiles of New Jersey. *Amer. Nat.*, Vol. I, 1867, pp. 23-30.  
March General account of the Cretaceous reptilia.
- .68 On Euclastes, a Genus of Extinct Chelonidæ. *Proc. Acad. Nat. Sci. Phila.* Vol. XIX, 1867, p. 31.  
June (?) No date acknowledged by the Academy. See "Index," p. xiii. Skull from Cretaceous of New Jersey. No description except length and breadth of skull

- .69 On *Megaptera braziliensis*. *Proc. Acad. Nat. Sci. Phila.* Vol. June XIX, 1867, p. 32.  
 (?) No date acknowledged by the Academy. See "Index," p. xiii. Nine lines describing a young skeleton presented to the Academy.
- .70 On *Euclastes*, a Genus of Extinct Chelonidæ. *Proc. Acad. Nat. Sci. Phila.* Vol. XIX, 1867, pp. 39-42.  
 July 20 See 68 for original notice. Adequate description here.
- .71 On the Families of the Raniform Anura. *Journ. Acad. Nat. Sci. Phila.*, Ser. 2, Vol. VI, 1867, pp. 189-206. (Separates, Aug. 1867.)
- .72 On a Collection of Reptiles from Owen's Valley, California, made by Dr. G. H. Horn, with Remarks on the Origin of Species. *Proc. Acad. Nat. Sci. Phila.* Vol. XIX, 1867, pp. 85, 86.  
 Nov. 1 Notes occurrence of *Scaphiropus holbrookii* near Schuylkill, New York. Compared the genera *Hyla*, *Scytotis*, *Osteocephalus* and *Trachycephalus*, which he considered represented a natural series measured by the relative degree of ossification of the cranium.
- .73 A New Genus of Cyprinoid Fishes from Virginia. *Proc. Acad. Nat. Sci. Phila.* Vol. XIX, 1867, pp. 95-97.  
 Nov. 1 *Phenacobius teretulus* N. G. et Sp., and *P. uranops*, from southeastern Va.
- 1868.74 Note on the Fossil Reptiles near Fort Wallace. Le Conte: Feb. *Notes on the Geology of the Survey for the Extension of the Union Pacific Railway, E. D., from the Smoky Hill River, Kansas, to the Rio Grande.* Philadelphia, 1868, p. 68.
- .75 Remarks on Four Species of Extinct Mammalia from the Miocene Deposits in Charles County, Maryland. *Proc. Acad. Nat. Sci. Phila.* Vol. XIX, 1867, pp. 131, 132.  
 May 11 *Rhabdosteus* described.
- .76 Remarks on the Cave Contents in Southwestern Virginia. *Proc. Acad. Nat. Sci. Phila.* Vol. XIX, 1867, pp. 137, 138.  
 May 11 Brief notice of fossils in cave, Wythe Co.
- .77 An Addition to the Vertebrate Fauna of the Miocene Period, with a Synopsis of the Extinct Cetacea of the United States. *Proc. Acad. Nat. Sci. Phila.* Vol. XIX, 1867, pp. 138-156.  
 May 11 Thirty-three species of Elasmobranchii and one Teleost (*Sphyrana speciosa*) determined by fossil teeth from Charles Co., Maryland. Two species of *Thecachampsa* based on isolated teeth; review of American fossil Cetacea, with descrip-

- tion of several new species, types in the Philadelphia Academy collection.
- .78 On the Genera of Fresh-Water Fishes *Hysilepis*, Baird, and  
May *Photogenis* Cope, their Species and Distribution. *Proc. Acad.*  
11 *Nat. Sci. Phila.* Vol. XIX, 1867, pp. 156-166.  
New species are: *Cyrinella cercastigma*; *Hypsilepis cocco-*  
*genis*; *H. galactuons*, *H. ardens*; *Phologenis telescopus*, *P.*  
*leucoidus*, and *P. scabriceps*.
- .79 A Review of the Species of the *Amblystomida*. *Proc. Acad.*  
May *Nat. Sci. Phila.* Vol. XIX, 1867, pp. 166-211.  
11 With notes on the anatomy and metamorphosis.
- .80 On the Habits of a Tipulideous Larva. *Proc. Acad. Nat.*  
May *Sci. Phila.* Vol. XIX, 1867, pp. 222-226.  
11
- .81 Remarks on Extinct Reptiles which approach Birds. *Proc.*  
May *Acad. Nat. Sci. Phila.* Vol. XIX, 1867, pp. 234, 235.  
11 Birdlike characters in *Laelaps* and *Compsognathus*.
- .82 Observations on some Vertebrata from Western Nevada and  
June Northern Lower California. *Proc. Acad. Nat. Sci. Phila.*  
8 Vol. XX, 1868, p. 2.  
Including two new species of boas of the genus *Lichanura*.
- .83 Observations on the Living Fauna of Caves in Southwestern  
June Virginia. *Proc. Acad. Nat. Sci. Phila.* Vol. XX, 1868, pp.  
8 85, 86.
- .84 The Birds of Palestine and Panama Compared. *Amer. Nat.*  
Sept. Vol. II, 1868, pp. 351-359.
- .85 Remarks on a new Enalosaurian. *Proc. Acad. Nat. Sci. Phila.*  
Nov. Vol. XX, 1868, pp. 92, 93.  
9 *Elasmosaurus platyurus* Cope, preliminary description.
- .86 An Examination of the Reptilia and Batrachia obtained by  
Nov. the Orton Expedition to Ecuador and the Upper Amazon,  
9 with Notes on Other Species. *Proc. Acad. Nat. Sci. Phila.*  
Vol. XX, 1868, pp. 96-140.  
Including new saurian genus *Opheognomon*. Synopses of  
the genera *Leptognathus* and *Pithecopus*, *Liocephalus*, *Cele-*  
*tus*, *Xenodon*.
- .87 A New Genus of Chelonidæ, *Osteopygis*, from the New  
Nov. Jersey Cretaceous Green-Sand. *Proc. Acad. Nat. Sci. Phila.*  
9 Vol. XX, 1868, p. 147.  
Genotype in the Academy collections.

- .88 On the Vertebræ of a Serpent from the Green-Sand of New  
Nov. Jersey. *Proc. Acad. Nat. Sci. Phila.* Vol. XX, 1868, p. 147.  
9 (Index title: On Fossil Snakes from New Jersey.)  
*Palæophis littoralis*, Cope.
- .89 On the Genus *Lalaps*. *Amer. Journ. Sci.*, Ser. 2, Vol. XLVI,  
Nov. No. 138, 1868, pp. 415-417.
- .90 On the Distribution of Fresh-Water Fishes in the Allegheny  
Dec. Region of Southwestern Virginia. *Journ. Acad. Nat. Sci.*  
2 *Phila.*, Ser. 2, Vol. VI, pp. 207-247. (Separates, December,  
1868.)  
Systematic list of the species; description of new species;  
and discussion of distribution due to geological and physi-  
ographical causes.
- .91 Synopsis of the Extinct Reptilia found in the Mesozoic and  
Dec. Tertiary Strata of New Jersey. *Geology of New Jersey*.  
(?) George H. Cook, State Geologist, 1868, Appendix B, pp. 733-  
738.
- .92 Synopsis of the Extinct Mammalia of New Jersey. *Geology*  
Dec. *of New Jersey*. George H. Cook, State Geologist, 1868, Ap-  
2 pendix C, pp. 739-742.
- .93 On the Fresh-Water Origin of Certain Deposits in West  
Dec. New Jersey. *Proc. Acad. Nat. Sci. Phila.* Vol. XX, 1868,  
2 pp. 157, 158.  
Raritan clays.
- .94 On Some Remains of Extinct Cetacea from the Miocene  
Dec. Beds of Maryland. *Proc. Acad. Nat. Sci. Phila.* Vol. XX,  
2 1868, pp. 159, 160.  
Two new species described. *Agaphelus* (modem) N. G.
- .95 On New Species of Extinct Reptiles, (*Clidastes iguanavus*  
Dec. and *Nectoportheus validus*). *Proc. Acad. Nat. Sci. Phila.*  
2 Vol. XX, 1868, p. 181.  
Isolated vertebræ from Cretaceous of New Jersey.
- .96 Second Contribution to the History of the Vertebrata of the  
Dec. Miocene Period of the United States. *Proc. Acad. Nat. Sci.*  
2 *Phila.* Vol. XX, 1868, pp. 184-194.  
Two genera, thirteen species described, mainly from the  
Calvert formation, types mostly in Academy collection.
- 1869.97 Synopsis of the *Cyprinidæ* of Pennsylvania. *Trans. Amer.*  
*Philos. Soc. N. S.* Vol. XIII, 1869, pp. 351-399, Pls. X-XIII  
and twenty-two figures.  
Systematic arrangement of genera and species, with con-  
siderable natural history data.

- .98 Supplement on Some New Species of American and African Fishes. *Trans. Amer. Philos. Soc. N. S.* Vol. XIII, 1869, pp. 400-407.  
 Descriptions of various species, mostly new, from North and South America and Africa.
- .99 Supplementary Synopsis of the *Esoces* of Middle North America. *Trans. Amer. Philos. Soc. N. S.* Vol. XIII, 1869, pp. 407-410.  
 Six species differentiated.
- .100 Our Own Birds. A Familiar Natural History of the Birds of the United States, by William L. Baily. Revised and edited by E. D. Cope. J. B. Lippincott Co., Phila. 12mo. (1869), pp. v-x, 11-265. Ill.
- .101 On the Reptilian Orders *Pythonomorpha* and *Streptosauria*.  
 Feb. *Proc. Boston Soc. Nat. Hist.* Vol. XII, 1869, pp. 250-266.
- .102 On the Crocodilian Genus *Perosuchus*. *Proc. Acad. Nat. Sci. Phila.* Vol. XX, 1868, p. 203.  
 6 From New Grenada (Colombia).
- .103 Synopsis of the Extinct Batrachia of North America. *Proc. Acad. Nat. Sci. Phila.* Vol. XX, 1868, pp. 208-221.  
 6 Brief descriptions of groups, with descriptions of new genera and species from Linton, Ohio, coal-measures and from Trias.
- .104 On *Agaphelus*, a Genus of Toothless Cetacea. *Proc. Acad. Nat. Sci. Phila.* Vol. XX, 1868, pp. 221-227.  
 6 Based upon part of a skeleton of a whale cast ashore in 1866 on the New Jersey coast.
- .105 On Some Cretaceous Reptilia. *Proc. Acad. Nat. Sci. Phila.* Vol. XX, 1868, pp. 233-242.  
 6 *Clidastes*, *Adocus*, additional characters of *Laelaps*.
- .106 On the Origin of Genera. *Proc. Acad. Nat. Sci. Phila.* Vol. XX, 1868, pp. 242-300.  
 6
- .107 Sixth Contribution to the Herpetology of Tropical America. Feb. *Proc. Acad. Nat. Sci. Phila.* Vol. XX, 1868, pp. 305-313.  
 6 Including the new genera *Loxopholes* (lizard) and *Lystris* (snake) from Colombia.
- .108 Observations on Some Extinct Reptiles, and on a Large Feb. Rodent, *Amblyrhiza inundata*. *Proc. Acad. Nat. Sci. Phila.* Vol. XX, 1868, p. 313. (Index title: On Extinct Reptiles.)  
 6 *Elasmosaurus orientalis*, *Amblyrhiza inundata*, brief notes.



- .109 Observations on Reptiles of the Old World. Art. II. *Proc.*  
 Feb. *Acad. Nat. Sci. Phila.* Vol. XX, 1868, pp. 316-323.  
 6 Including new genera *Panaspis* (lizard from Australia)  
 and *Letheobia* (snake from Zanzibar).
- .110 Note on Disease among the fossil Reptilia of New Jersey.  
 March *Amer. Nat.* Vol. III, No. 1, 1869, p. 55.  
 Quotation of a letter from Cope, which, however, does not  
 refer to pathologic but a normal condition in mosasaur jaw.
- .111 Descriptions of Some Extinct Fishes Previously Unknown.  
 April *Proc. Boston Soc. Nat. Hist.* Vol. XII, 1869, pp. 310-317.  
 Three species of fossil Teleosts and seven Elasmobranchs  
 determined by fragments from Coastal Plain of eastern  
 United States.
- .112 The Fossil Reptiles of New Jersey. *Amer. Nat.* Vol. III,  
 April No. 2, 1869, pp. 84-91, Pl. 2.  
 Popular description and restoration of Cretaceous types.
- .113 A New Salamander. *Amer. Nat.* Vol. III, No. 4, 1869, p.  
 June 222.  
 Notice of a new genus, *Thorius*, from Mexico.
- .114 New Finner Whale. *Amer. Nat.* Vol. III, No. 5, 1869, pp.  
 July 277, 278.
- .115 Remarks on a New Series of Fossils from the Limestone  
 July Caves in the Southern States. *Proc. Acad. Nat. Sci. Phila.*  
 20 Vol. XXI, 1869, p. 3.  
*Stereodectes tortus* brief description; Wythe Co., Va.,  
 fauna.
- .116 Remarks on *Heloderma suspectum*. *Proc. Acad. Nat. Sci.*  
 July *Phila.* Vol. XXI, 1869, p. 5. (Index title: On *Heloderma*  
 20 *horridum*).  
 Exhibition of a *Heloderma horridus* from Tehuantepec.
- .117 Third Contribution to the Fauna of the Miocene Period of  
 July the United States. *Proc. Acad. Nat. Sci. Phila.* Vol. XXI,  
 20 1869, pp. 6-12.  
*Tretosphys*, *Zarhachis*, *Eschrichtius*, etc., Calvert formation  
 of Maryland and Miocene of New Jersey.
- .118 On the Cetaceans of the Western Coast of North America.  
 July By C. M. Scammon. Edited by Prof. E. D. Cope. *Proc.*  
 20 *Acad. Nat. Sci. Phila.* Vol. XXI, 1869, pp. 13-63, Figs.  
 1-17, Pl. I.  
 Contains much new material written in by Cope. Part I  
 (pp. 14-32)—Systematic Synopsis of the Species of the

- Cetaceans of the West Coast of North America—is entirely his. Also contains descriptions of new species inserted by Cope.
- .119 Remarks on Specimens of Extinct Animals from the Island  
July of Anguilla, West Indies. *Proc. Acad. Nat. Sci. Phila.* Vol.  
20 XXI, 1869, p. 92.  
*Loxomylus longidens*, named, no description.
- .120 A Review of the Species of *Plethodontidæ* and *Desmog-*  
July *nathidæ*. *Proc. Acad. Nat. Sci. Phila.* Vol. XXI, 1869,  
20 pp. 93-118.
- .121 Remarks on Extinct Reptiles from New Jersey. (Hay:  
July Remarks on *Holops brevispinus*, *Ornithotarsus immanis*, and  
20 *Macrosaurus proriger*.) *Proc. Acad. Nat. Sci. Phila.* Vol.  
XXI, 1869, p. 123.  
*Holops* described from an incomplete cranium and *Ornitho-*  
*tarsus* from parts of hind leg bones, tooth from New Jersey  
Cretaceous; *Macrosaurus proriger* (= *Tylosaurus*) upon frag-  
ment of muzzle (? Mus. Comp. Zool.) from Kansas Cre-  
taceous.
- .122 On *Mylodon annectens* from the Post-Tertiary Rocks of  
Aug. South America. *Proc. Amer. Philos. Soc.* Vol. XI, 1869,  
20 pp. 15, 16.
- .123 The Cretaceous Tortoises (and on Modifications of Form in  
Aug. the Dinosaurian Skeleton, Indicating an Approach to the  
20 Birds). *Proc. Amer. Philos. Soc.* Vol. XI, 1869, p. 16.  
Brief abstract.
- .124 A New Mosasauroid Reptile. *Proc. Amer. Philos. Soc.* Vol.  
Aug. XI, 1869, pp. 116, 117.  
20 *Clidastes propython*, *Polycotylus latipinnis*, *Ornithotarsus*  
*immanis*, brief abstracts of descriptions.
- .125 On some Reptilian Remains. *Amer. Journ. Sci.* Ser. 2,  
Sept. Vol. XLVIII, 1869, No. 143, p. 278.  
(?)
- .126 On Two New Genera of Extinct Cetacea. *Amer. Nat.* Vol.  
Oct. III, No. 8, 1869, pp. 444, 445. *Canad. Nat.* Ser. 2, Vol. IV,  
1869, pp. 320, 321.  
Abstract of paper before Amer. Assoc. Adv. Sci. Tenable  
descriptions of *Anoplouassa forcipata*; notices of Anguilla  
fossils but no names.
- 1870.127 Seventh Contribution to the Herpetology of Tropical Amer-  
Feb. ica. *Proc. Amer. Philos. Soc.* Vol. XI, 1869, pp. 147-169,  
18 Pls. IX-XI.

Mostly from Mexico, two from the Island of St. Martins, Spanish West Indies, and with a list of species in Orton's collection from Pebas, Equador, on the Upper Amazon and in Sumichast's from Tehuantepec, Mexico. Three new genera: *Symphimus* and *Teleolapsis* (Mexican snakes), and *Stereocyclops* (raniformian from Brazil).

- .128 Feb. 18 Synopsis of the Extinct Mammalia of the Cave Formations in the United States, with Observations on some Myriapoda found in and near the same, and on some Extinct Mammals of the Caves of Anguilla, W. I., and of Other Localities. *Proc. Amer. Philos. Soc.* Vol. XI, 1869, pp. 171-192, Pls. III-V.  
List of species and descriptions of five new mammals and five new myriapods from Virginia. Extended descriptions of *Amblyrhiza* and *Hoxomylus* from Anguilla.
- .129 Feb. 18 Second Addition to the History of the Fishes of the Cretaceous of the United States. *Proc. Amer. Philos. Soc.* Vol. XI, 1869, pp. 240-244.  
Nine species of Teleosts and Elasmobranchs based on teeth and various fragments from Coastal Plain of eastern United States.
- .130 March The Limbs of Ichthyosaurus and Plesiosaurus. *Amer. Nat.* Vol. IV, No. 1, 1870, p. 127.  
Review of Gegenbaur's essay.
- .131 April Synopsis of the Extinct Batrachia, Reptilia and Aves of North America. *Trans. Amer. Philos. Soc.* N. S. Vol. XIV, 1870, pp. 1-252, Pls. I-XIVa and Figs. 1-55. Separates April, 1870, contain only pp. 1-235, Pls. II-XII and Figs. 1-51. Note from Miss Brown's MSS.
- .132 April Discovery of a Huge Whale in North Carolina. *Amer. Nat.* Vol. IV, No. 1, 1870, p. 128.  
*Mesoteras kerrianus*.
- .133 April 12 Remarks on the Cranium of Whales and on Certain Fossil Reptiles from the North Carolina Cretaceous. *Proc. Acad. Nat. Sci. Phila.* Vol. XXI, 1869, pp. 191, 192.  
*Eschrichtus polyporus* described; *Hadrosaurus triops* and *Hypribena crassicauda*, based on vertebræ; *Polydectes biturgidus* upon a tooth. The second and third of supposed Cretaceous age "intrusive in Miocene beds."
- .134 May On Some New and Little Known Myriapoda from the Southern Alleghenies. *Trans. Amer. Entomol. Soc.* III, 1870-1871, pp. 65-67. *Ann. & Mag. Nat. Hist.* Ser. 4, Vol. VI, 1870, pp. 425-427.

- .135 On *Megadactylus polyzelus* of Hitchcock. *Amer. Journ. Sci.*  
 May Ser. 2, Vol. XLIX, pp. 390-392. *Ann. & Mag. Nat. Hist.*  
 Ser. 4, Vol. V, 1870, pp. 454, 455.
- .136 Die bis jetzt bekannten Schildkroten u. d. bei Kelheim u.  
 July Hannover neu aufgefunden ältesten Arten derselben, von Dr.  
 G. A. Maack (Review). *Amer. Journ. Sci.* Ser. 2, Vol. L,  
 1870, pp. 136-139.
- .137 On *Elasmosaurus platyurus*, Cope. *Amer. Journ. Sci.* Ser.  
 July 2, Vol. L, 1870, pp. 140, 141.
- .138 On the Hypothesis of Evolution, Physical and Metaphysical.  
 July *Lippincott's Mag.* Vol. VI, 1870, pp. 29-41; 173-180; 310-319.  
 The pages appeared in July, August and September.
- .139 On Some Etheostomine Perch from Tennessee and North  
 July Carolina. *Proc. Amer. Philos. Soc.* Vol. XI, 1870, pp. 261-270.  
 15 Twenty species described (eight new).
- .140 On Some Reptilia of the Cretaceous Formation of the United  
 July States. *Proc. Amer. Philos. Soc.* Vol. XI, 1870, pp. 271-  
 15 274 and 275.  
*Polydectes biturgidus*, *Liodon oogrope* and *L. validus*, de-  
 scribed; *Taphrosaurus*, new genus.
- .141 Molar Tooth and Fragment of Skeleton. *Proc. Amer. Philos.*  
 July *Soc.* Vol. XI, 1870, p. 278.  
 15 Specimens exhibited.
- .142 Verbal Communication at Meeting of the American Philo-  
 July sopherical Society, February 18, 1870. *Proc. Amer. Philos.*  
 15 *Soc.* Vol. XI, 1870, p. 284.  
 Notice of new species of *Mosasaurus*, *M. oarthrus*, *M.*  
*fulciatus*, from the New Jersey Cretaceous.
- .143 Fourth Contribution to the History of the Fauna of the  
 July Miocene and Eocene Periods of the United States. *Proc.*  
 15 *Amer. Philos. Soc.* Vol. XI, 1870, pp. 285-294.  
 Cetacea; *Sus* sp. (subsequently *S. vagrans*, Cope) and  
*Thinotherium* gen. nov.; fishes. Types of *S. vagrans* and  
*Thinotherium annulatum* in American Museum of Natural  
 History.
- .144 On *Adocus*, a Genus of Cretaceous Emydidæ. *Proc. Amer.*  
 July *Philos. Soc.* Vol. XI, 1870, pp. 295-298.  
 15 Extended description, five species referred.
- .145 Note on Skeletons Found Near Woodbury. *Proc. Amer.*  
 July *Philos. Soc.* Vol. XI, 1870, pp. 310, 311.  
 15 Probably early Europeans.

- .146 Photographic Pictures of Figures of the Human Foot on  
 July Rocks. *Proc. Amer. Philos. Soc.* Vol. XI, 1870, p. 311.  
 15 Indian drawings.
- .147 Fossil Fishes. *Proc. Amer. Philos. Soc.* Vol. XI, 1870, p.  
 July 316.  
 15 Exhibit of fishes from Green River shales—2 named but not  
 described. See also No. 154.
- .148 Observations on the Fauna of the Southern Alleghanies.  
 Sept. *Amer. Nat.* Vol. IV, No. 7, 1870, pp. 392-402.  
 Fishes barely referred to.
- .149 Additional Note on *Elasmosaurus platyrurus*. *Amer. Journ.*  
 Sept. *Sci. Ser.* 2, Vol. I., 1870, pp. 268, 269.
- .150 On the Structural Characteristics of the Cranium in the  
 Oct. Lower Vertebrata. *Amer. Nat.* Vol. IV, No. 8, 1870, pp.  
 505-508.  
 An abstract of 163.
- .151 Reptiles of the Triassic Formation of the United States.  
 Nov. *Amer. Nat.* Vol. IV, No. 9, 1870, pp. 562, 563.  
 Abstract of paper before A. A. A. S. No. 166. *Belodon*  
*lepturus* named, no description.
- .152 Vertebræ and other parts of a New Species of *Bottosaurus*.  
 Nov. *Proc. Amer. Philos. Soc.* Vol. XI, 1870, p. 367.  
 21 Abstract four lines.
- .153 A New Dycynodont cranium from the Trias of South Africa.  
 Nov. *Proc. Amer. Philos. Soc.* Vol. XI, 1870, p. 370.  
 21 Abstract of No. 156.
- .154 Observations on the Fishes of the Tertiary Shales of Green  
 Nov. River, Wyoming Territory. *Proc. Amer. Philos. Soc.* Vol.  
 21 XI, 1870, pp. 380-384.  
*Asineops squamifrons* N. G. et Sp., two species of *Clupea*  
 and one of *Cyprinodon*.
- .155 Supplementary notice of a New Chimaerid from New Jer-  
 Nov. sey. *Proc. Amer. Philos. Soc.* Vol. XI, 1870, p. 384.  
 21 *Leptomylus cookii*, Cope.
- .156 *Lystrosaurus frontosus*. *Proc. Amer. Philos. Soc.* Vol. XI,  
 Nov. 1870, p. 419.  
 21 A new genus of Dicynodont reptiles from the Permian of  
 South Africa. (Type believed to be in the collections of  
 Yale University.)
- .157 On *Astracanthus Agassiz*. *Proc. Amer. Philos. Soc.* Vol.  
 Nov. XI, 1870, pp. 439, 440. (5 lines).  
 21 First record of this genus from the United States.

- .158 On *Labidesthes* Cope. *Proc. Amer. Philos. Soc.*, Vol. XI,  
Nov. 1870, p. 440. (5 lines.)  
21 Verbal notes.
- .159 On the Reptilia of the Triassic Formations of the Atlantic  
Nov. Region of the United States. *Proc. Amer. Philos. Soc.* Vol.  
21 XI, 1870, pp. 444-446. *Ann. & Mag. Nat. Hist.*, Ser. 4, Vol.  
VI, 1870, pp. 498-500.  
Discussion of affinities of various species; *Pneumatoar-*  
*thrus* described.
- .160 Some Australian Skulls and a Maori Skull. *Proc. Amer.*  
Nov. *Philos. Soc.* Vol. XI, 1870, p. 446.  
21
- .161 A Partial Synopsis of the Fishes of the Fresh Waters of  
Nov. North Carolina. *Proc. Amer. Philos. Soc.* Vol. XI, 1870,  
21 pp. 448-495, figs. 1, 2.  
The first considerable report on the fresh-water fishes of  
N. C. 81 species are described. Included are descriptions of  
a considerable number of new as well as old species from  
sections reaching from Maine to Indiana.
- .162 *Liodon perlatus* and *Mosasaurus brumbyi*. *Proc. Amer.*  
Nov. *Philos. Soc.* Vol. XI, 1870, pp. 496-497.  
21 Abstract, seven lines.
- .163 On the Structure of the Crania of the Orders of Reptilia  
Nov. and Batrachia. *Proc. Amer. Philos. Soc.* Vol. XI, 1870, pp.  
21 497, 498. *Ann. & Mag. Nat. Hist.* Ser. 4, Vol. VII, 1871,  
pp. 67, 68.  
Recent and extinct. Notes. Ichthyopterygia and Ano-  
modontia.
- 1871.164 Catalogue of Batrachia and Reptilia obtained by J. A. Mc-  
Niel in Nicaragua. *Second and Third Ann. Report, Trustecs,*  
*Peabody Acad. Sci.* 1869-1870, pp. 80-82.  
Including a new genus of snake, *Enulius*.
- .165 Catalogue of Reptilia and Batrachia obtained by C. J. May-  
nard in Florida. *Second and Third Ann. Report, Trustecs,*  
*Peabody Acad. Sci.*, 1869-1870, pp. 82-85.
- .166 On the Homologies of some of the Cranial Bones of the  
Reptilia and on the Systematic Arrangement of the Class.  
*Proc. A. A. A. S.* XIX Meet. 1870, pp. 194-246, figs. 1-24.  
With a catalogue of the families of the Reptilia and a note  
on the stratigraphic relation of the orders.
- .167 Note in Reply to Dr. Seeley's Remarks on my Interpretation  
of the Structure of the Cranium of *Ichthyosaurus*.  
*Proc. A. A. A. S.* XIX Meet. 1870, pp. 246, 247.

- .168 On the Fossil Reptiles and Fishes of the Cretaceous Rocks of Kansas. Preliminary Report, U. S. Geological Survey of Wyoming, etc. (Being a Second [4th] Ann. Report of Progress), 1871, pp. 385-424.  
 For fishes, 5 species of *Saurocephalus*, and 1 each of *Ichthyodectes*, *Apsopilix* and *Sphyaena*, are described, and a tooth of *Enchodus* sp., is briefly referred to.
- .169 On the Fishes of the Tertiary Shales of Green River, Wyoming Territory. Preliminary Report, U. S. Geological Survey of Wyoming, etc. (Being a Second [4th] Ann. Report of Progress), 1871, pp. 425-431.  
 Two species of *Asineops* are described; the genus *Erematopterus* is established and the species *E. nickseri* described; 2 genera of *Clupea* are described as is also *Osteoglossum encoastum* N. Sp.
- .170 Recent Reptiles and Fishes. Report on the Reptiles and Fishes obtained by the Naturalists of the Expedition. Preliminary Report, U. S. Geological Survey of Wyoming, etc. (Being a Second [4th] Ann. Report of Progress), 1871, pp. 432-442.  
 Eight reptiles from Utah, Colorado and Wyoming. In fishes 1 Cottid, 2 Salmonids, 4 Catostomids, and 11 Cyprinids including 15 new species are described.
- .171 New Fossil Fishes. *Amer. Nat.* Vol. IV, 1870-1871, p. 695.  
 Jan. *Amer. Journ. Sci.* Ser. 3, Vol. I, p. 386.  
 Species of *Saurocephalus* Harland and *Ichthyodectes* gen. nov. are described from specimens collected by Professor B. F. Mudge in the Cretaceous of Kansas. Abstract of 175.
- .172 On Siredon-Metamorphoses. *Amer. Journ. Sci.* Ser. 3, Vol. I, 1871, pp. 89, 90. Reprint, *Ann. & Mag. Nat. Hist.* Ser. 4, Vol. VII, 1871, pp. 246, 247.  
 Feb. Reprinted by Dr. H. C. Yarrow in *Rept. U. S. Geol. Survey West of the 100th Meridian* (Wheeler), Vol. V, Chap. IV, pp. 517-519.
- .173 Some Remains of a New Cretaceous Tortoise and on *Laelaps*. *Proc. Amer. Philos. Soc.* Vol. XI, 1870, p. 515.  
 Feb. 17 *Adocus syntheticus* described; metatarsals of *Laelaps*.
- .174 The Osteology of *Megaptera bellicosa*. *Proc. Amer. Philos. Soc.* Vol. XI, 1870, p. 516.  
 Feb. 17
- .175 On the *Saurodontidæ*. *Proc. Amer. Philos. Soc.* Vol. XI, 1870, pp. 529-538. Abstract, "New Fossil Fishes," *Amer. Nat.* Vol. IV, 1870, p. 695; and *Amer. Journ. Sci.* Ser. 3, Vol. I, p. 386.

- See 171 for note on new genera. Five species of *Saurocephalus* (three new) described, one *Saurodon* and *Ichthyodectes ctenodon* Sp. N. For preliminary account see No. 171.
- .176 On the Fishes of a Fresh Water Tertiary in Idaho, discovered by Capt. Clarence King. *Proc. Amer. Philos. Soc.* Vol. XI, 1870, pp. 538-547.  
Feb. 17  
Chiefly Cyprinid fishes of supposed Pliocene age: *Dia-stichus*, *Oligobelus*, *Anchybopsis*, *Rhabdofario*, new genera, based upon pharyngeal bones except the last.
- .177 On the Adocidæ. *Proc. Amer. Philos. Soc.* Vol. XI, 1870, pp. 547-553.  
Feb. 17  
Additional observations upon *Adocus* Cope, with a key to the species; *Zygoramma*, *Homorophus*, new genera of Adocidæ, based upon fossils from the New Jersey Cretaceous.
- .178 Eighth Contribution to the Herpetology of Tropical America. *Proc. Amer. Philos. Soc.* Vol. XI, 1870, pp. 553-559.  
Feb. 17  
Report upon collections of Ophidia and Batrachia from Pebas, Ecuador (Hauxwell), Brazil (Thayer Exp.), Turk's Island, W. I. (Ebell), and St. Eustatia (van Rigiersma). *Enulius* gen. nov. ophid. from Nicaragua.
- .179 Contribution to the Ichthyology of the Marañon. *Proc. Amer. Philos. Soc.* Vol. XI, 1870, pp. 559-570, eight figures.  
Feb. 17  
*Stethaprion*, *Holotaxis*, *Plethodectes*, *Odontostilbe*, new Characid genera described. Five new species of Siluridæ, and three new Chromidæ (Cichlidæ) described.
- .180 *Mosasaurus maximus* (and *Liodon ictericus* and *L. mudgei*). (Frazer—Note on two Species of Pythonomorpha from Kansas and New Mexico.) *Proc. Amer. Philos. Soc.* Vol. XI, 1870, pp. 571-572.  
Feb. 17
- .181 On some Species of Pythonomorpha from the Cretaceous Beds of Kansas and New Mexico. *Proc. Amer. Philos. Soc.* Vol. XI, 1870, pp. 574-584. Abstract, *Amer. Nat.* Vol. VI, 1872, p. 246.  
Feb. 17  
*Liodon dyspelor* from New Mexico; *L. ictericus* and *mudgei*; and *Clidastes cinerarium* from Kansas.
- .182 On Three Extinct Astaci from the Fresh Water Territory of Idaho. *Proc. Amer. Philos. Soc.* Vol. XI, 1870, pp. 605-607.  
Feb. 17  
Types in the Smithsonian Institution. King expedition.
- .183 Note on *Saurocephalus* Harlan. *Proc. Amer. Philos. Soc.* Vol. XI, 1870, p. 608. Abstract, *Amer. Journ. Sci. Ser.* 3, Vol. I, 1871, p. 386.  
Feb. 17  
Discussion of affinities.



- .184 Fossils from West Indian Island Caves. *Proc. Amer. Philos. Soc.* Vol. XI, 1870, p. 608. Abstract, *Amer. Journ. Sci.* Ser. 3, Vol. I, p. 385.  
 Feb. 17 Notice of additional collections from Anguilla, *Loxomylus latidens* described.
- .185 On the System of the Batrachian Anura of the British Museum Catalogue. *Amer. Journ. Sci.* Ser. 3, Vol. I, 1871, pp. 198-203.  
 March
- .186 Cave Mammals in Pennsylvania. *Amer. Nat.* Vol. V, 1871, p. 58.  
 March Abstract of 196.
- .187 Remarks on a Specimen of *Trigonocephalus* and *Oxyrrhopus plumbeus*. *Proc. Acad. Nat. Sci. Phila.* Vol. XXII, 1870, p. 90.  
 March 14 Fer-de-lance a serious pest on the islands of Martinique and Guadeloupe, might be reduced by importation of *Oxyrrhopus* which feeds on them.
- .188 Observations on Some Fishes New to American Fauna found at Newport, Rhode Island, by Samuel Powell. *Proc. Acad. Nat. Sci. Phila.* Vol. XXII, 1870, pp. 118-121.  
 March 14 Eleven species listed and some described, including three new species mainly West Indian stragglers brought up by the Gulf Stream.
- .189 Supplementary Note on Two New Fishes from the Southern Coast. *Proc. Acad. Nat. Sci. Phila.* Vol. XXII, 1870, pp. 120, 121.  
 March 14 *Centropristis subligularius* and *Gobiesax strumosus* N. Sp., from Hilton Head, S. C.
- .190 Note on Fishes from Atlantic City, New Jersey. *Proc. Acad. Nat. Sci. Phila.* Vol. XXII, 1870, p. 121.  
 March 14 *Priacanthus altus* and *Hemiramphus macrorhynchus*.
- .191 Remarks on Fossil Reptiles from the Cretaceous Beds of Kansas. *Proc. Acad. Nat. Sci. Phila.* Vol. XXII, 1870, p. 132.  
 March 14 Tenable description of *Liodon ictericus*, *L. mudgei*, *L. dyspelor*, *Clidastes cinerionum* (sic).
- .192 Observations on *Sauropleura remex* and *Osteocephalus amphiuminus*. *Proc. Acad. Nat. Sci. Phila.* Vol. XXIII, 1871, p. 53.  
 May 9
- .193 On Fishes from the Amazon River. *Proc. Acad. Nat. Sci. Phila.* Vol. XXIII, 1871, p. 55.  
 May 9 Exhibit and remarks on four species found above the mouth of the Rio Negro.

- .194 On some of the Siluroids of the Amazon. *Proc. Acad. Nat. Sci. Phila.* Vol. XXIII, 1871, p. 112.  
July
- 11 Oral remarks on certain anatomical structures as a basis for taxonomy of Silurids.
- .195 On *Plectognathi* and *Lophobranchii*. *Proc. Acad. Nat. Sci. Phila.* Vol. XXIII, 1871, pp. 157, 158.  
Aug.
- 15 Structure serving as basis for differentiation from other fishes and for classification in the system.
- .196 The Port Kennedy Bone Cavern. *Proc. Amer. Philos. Soc.* Vol. XII, 1871, pp. 15, 16.  
Aug.
- 18 For abstract see 186. Preliminary notice of the fauna. See. No. 200.
- .197 Supplement to the "Synopsis of the Extinct Batrachia and Reptilia of North America." *Proc. Amer. Philos. Soc.* Vol. XII, 1871, pp. 41-52.  
Aug.
- 18 Descriptions of *Liodon sectorius* n. sp., *Zygoramma microglypha* n. sp., *Catapleura ponderosa* n. sp., *Bottosaurus macro-rhynchus* Harlan, *Hadrosaurus cavatus* n. sp., all from the New Jersey Cretaceous.
- .198 On Two Extinct Forms of Physostomi of the Neotropical Region. *Proc. Amer. Philos. Soc.* Vol. XII, 1871, pp. 52-55.  
Aug.
- 18 *Prymnetes* and *Anædopogon*, new genera.
- .199 On the Occurrence of Fossil *Cobitidæ* in Idaho. *Proc. Amer. Philos. Soc.* Vol. XII, 1871, p. 55.  
Aug.
- 18 *Diastichus* Cope referred to the *Cobitidæ*.
- .200 Preliminary Report on the Vertebrata discovered in the Port Kennedy Bone Cave. *Proc. Amer. Philos. Soc.* Vol. XII, 1871, pp. 73-102, figs. 1-20.  
Aug.
- 18 Descriptions and notices of thirty-four species of mammals, thirteen of them new, and *Praotherium*, N. Gen.
- .201 On *Megaptera bellicosa*. *Proc. Amer. Philos. Soc.* Vol. XII, 1871, pp. 103-108, figs. 21-22.  
Aug.
- 18 Description of skeleton from St. Bartholomew, W. I.
- .202 Additional Note on *Balænoptera* vel *Sibbaldius sulfureus* Cope. *Proc. Amer. Philos. Soc.* Vol. XII, 1871, p. 108.  
Aug.
- 18
- .203 Remarks on Ancient Rock Inscriptions in Ohio. *Amer. Nat.* Vol. V, 1871, p. 546.  
Sept.
- .204 On the Extinct Tortoises of the Cretaceous of New Jersey. *Amer. Nat.* Vol. V, 1871, pp. 562-564. (Abstract of paper read before A. A. A. S. Exactly reprinted in *Proc. A. A. A. S.* XX Meet., pp. 344, 345.)  
Sept.

- .205 Observations on the Systematic Relations of the Fishes.  
 Sept. *Amer. Nat.* Vol. V, 1871, pp. 579-593. *Ann. & Mag. Nat. Hist.* Ser. 4, Vol. IX, 1872, pp. 155-168.  
 Abridged form of 211.
- .206 The Laws of Organic Development. (Abstract of paper  
 Sept. before A. A. A. S. but not printed in *Proceedings.*) *Amer. Nat.* Vol. V, 1871, pp. 593-605. *Nature*, Vol. V, 1872, pp. 252-254.
- .207 Ninth Contribution to the Herpetology of Tropical America.  
 Oct. *Proc. Acad. Nat. Sci. Phila.* Vol. XXIII, 1871, pp. 200-204.
- 24 From the Isthmus of Darien, Isthmus of Tehuantepec, eastern Ecuador, southeastern Haiti. A new snake genus, *Nothopsis* from Isthmus of Darien. Annotated synopsis of the *Teleuraspides*.
- .208 Geological Expedition to Kansas. *Amer. Nat.* Vol. V, 1871,  
 Nov. pp. 792-795.
- .209 Life in the Wyandotte Cave. *Ann. & Mag. Nat. Hist. Ser.*  
 Nov. 4, Vol. VIII, 1871, pp. 368-370. (Copied from *Indianapolis Journ.* Sept. 5, 1871.)  
*Amblyopsis* sp., a blind fish found.
- .210 Contribution to the Ichthyology of the Lesser Antilles. *Trans. Amer. Philos. Soc.* n. s. Vol. XIV, 1871, pp. 445-483; figs. 1-10.  
 Faunal list based on collection from St. Martins, St. Croix, and St. Kits. Included are numerous new species.
- 1872.211 Observations on the Systematic Relations of the Fishes.  
*Proc. A. A. A. S.* XX Meet. 1871, pp. 317-343.  
 For abstract see 205. Extensive presentation of Cope's views on the subject.
- .212 On the Geology and Palæontology of the Cretaceous Strata of Kansas. *Preliminary Report, U. S. Geol. Survey of Montana*, etc. Being a Fifth Annual Report of Progress, Part III, pp. 318-349.  
 Reprinted, with slight changes, by W. E. Webb, in "Buffalo Land: An Authentic Account of the Discoveries, Adventures, and Mishaps of a Scientific and Sporting Party in the Wild West . . ." 8vo. Hubbard Bros., Philadelphia, 1872 (pp. 338-365). Extended description of vertebrate fauna of Niobrara formation, many new species.
- .213 On the Vertebrate Fossils of the Wahsatch Strata. *Preliminary Report, U. S. Geol. Survey of Montana*, etc. Being a Fifth Annual Report of Progress, Part III, pp. 350-353.

- Redescription of *Bathmodon*, *Loxolophodon* described. Compare No. 266. This report is reviewed in *Amer. Journ. Sci.* (3) III, May, 1872, and must therefore have been published in May or earlier.
- .214 Report on the Recent Reptiles and Fishes of the Survey, collected by Campbell Carrington and C. M. Dawes. *Preliminary Report, U. S. Geol. Survey of Montana*, etc. Being a Fifth Annual Report of Progress, Part IV, pp. 467-476. Twenty species described, 15 being new.
- .215 Sketch of the Zoology of Pennsylvania. *Walling and Gray's Topographical Atlas of Pennsylvania*, pp. 19-22.
- .216 Carboniferous Reptiles of Ohio. *Amer. Nat.* Vol. VI, 1872, Jan. p. 46.  
Abstract of 220.
- .217 On the Fishes of the Ambyiacu River. *Proc. Acad. Nat. Sci. Phila.* Vol. XXIII, 1871, pp. 250-294, Pls. III-XVII.  
Jan. 16 Comprises an extensive collection from Pebas, referable to 50 genera and 76 species, mostly Chromids (Cichlids), Characins, and Silurids. Nine genera and 47 species are new to science with one exception belonging to the above.
- .218 Note on some Cretaceous Vertebrata in the State Agricultural College of Kansas, U. S. A. *Proc. Amer. Philos. Soc.* Vol. XII, 1871, pp. 168-170.  
Feb. 2 *Anognmius* gen. nov. and *Liodon latispinis* sp. nov. described.
- .219 Sketch of an Expedition in the Valley of the Smoky Hill River in Kansas. *Proc. Amer. Philos. Soc.* Vol. XII, 1871, pp. 174-176.  
Feb. 2
- .220 Observations on the Extinct Batrachian Fauna of the Carboniferous of Linton, Ohio. *Proc. Amer. Philos. Soc.* Vol. XII, 1871, p. 177.  
Feb. 2 List of genera with brief diagnosis of characters. *Tuditamus*, *Cocytimus*, *Phlegthontia* are new. For abstract see 216.
- .221 Remarks on Hyrtl's Collection. *Proc. Amer. Philos. Soc.* Vol. XII, 1871, p. 191.  
Feb. 2
- .222 Observations on the Distribution of certain Extinct Vertebrata in North Carolina. *Proc. Amer. Philos. Soc.* Vol. XII, 1871, pp. 210-216, Pls. I-IV.  
Feb. 2 Chiefly Triassic and Cretaceous fossils. *Hypsibema* gen. nov. and *Hadrosaurus tripes* sp. nov. are based upon skeleton fragments of Trachodont dinosaurs.

- .223 The Method of Creation of Organic Forms. *Proc. Amer. Philos. Soc.* Vol. XII, 1871, pp. 229-263.  
Feb.
- 2  
.224 On a Species of Galeodes. *Proc. Acad. Nat. Sci. Phila.*  
Feb. Vol. XXIII, 1871, p. 295.
- 13  
.225 On the Fauna of the Wyandotte Cave in Southern Indiana.  
Feb. *Proc. Acad. Nat. Sci. Phila.* Vol. XXIII, 1871, p. 297.  
13 *Amblyopsis spelaeus*, the only fish found.
- .226 On some Fossil Reptiles from the Cretaceous Chalk of West-  
Feb. ern Kansas. *Proc. Acad. Nat. Sci. Phila.* Vol. XXIII, 1871,  
13 pp. 297, 298.  
Preliminary notice, names but no adequate descriptions of  
four new species of Mosasaurs.
- .227 On a peculiar Habit in *Phrynosoma*. *Proc. Acad. Nat. Sci.*  
Feb. *Phila.* Vol. XXIII, 1871, p. 305.  
13 *P. ornaticissima* Grd. Squirting blood from the eyes.
- .228 The Survival of the Fittest. *Nature*, Vol. V, 1872, p. 363.  
March
- 7  
.229 On a New Fossil Reptile from the Cretaceous Strata of  
April Kansas. *Amer. Nat.* Vol. VI, 1872, p. 247.  
Abstract of 263.
- .230 Families of Fossil Fishes of the Cretaceous of Kansas.  
April *Amer. Nat.* Vol. VI, 1872, pp. 249, 250.  
Abstract of 265.
- .231 On *Protostega*. *Amer. Nat.* Vol. VI, 1872, p. 251.  
April Abstract of 268.
- .232 On Two New Species of *Ornithosaurians* from the Kansas  
April Cretaceous. *Amer. Nat.* Vol. VI, 1872, p. 251.  
Abstract of 267.
- .233 Remarks on Mr. Price's "Phases of Modern Philosophy"  
April (Abstract). *Amer. Nat.* Vol. VI, 1872, pp. 251, 252.  
Abstract of 264.
- .234 Description of the Common Lizard of Socorro. *Proc. Bos-*  
April *ton Soc. Nat. Hist.* Vol. XIV, 1871, p. 303.  
*Uta auriculata*.
- .235 On *Megaptera bellicosa*. *Proc. Acad. Nat. Sci. Phila.* Vol.  
April XXIV, 1872, p. 11.  
16
- .236 On *Holops pneumaticus*. *Proc. Acad. Nat. Sci. Phila.* Vol.  
April XXIV, 1872, pp. 11, 12.  
16

- .237 List of the Reptilia of the Eocene Formations of New Jersey. *Proc. Acad. Nat. Sci. Phila.* Vol. XXIV, 1872, pp. 14-18.  
April 16 Two new species of *Chelonia* described and one new crocodilian.
- .238 Evolution and its Consequences. *Penn Monthly* Vol. III, 1872, pp. 222-236; 366-385; 429-439; 461-476.  
May-Sept. The instalments appeared in May, July, August and September, respectively.
- .239 Curious Habit of a Snake. *Amer. Nat.* Vol. VI, 1872, p. 309.  
May *Proc. Acad. Nat. Sci. Phila.* Vol. XXIV, 1872, p. 40.  
*Oryzophis astivus* from North Carolina.
- .240 Remarks on Discoveries recently made by Prof. O. C. Marsh. *Proc. Acad. Nat. Sci. Phila.* Vol. XXIV, 1872, pp. 140, 141.  
June 8 Separates, June 8, 1872. Date taken from Miss Brown's MSS. Critical review of Marsh's contributions on Mosasaurs.
- .241 Synopsis of the Species of the Chelydrinae. *Proc. Acad. Nat. Sci. Phila.* Vol. XXIV, 1872, pp. 22-29.  
June 25
- .242 On an Extinct Whale from California. *Proc. Acad. Nat. Sci. Phila.* Vol. XXIV, 1872, pp. 29, 30.  
June 25 *Eschrichtius davidsonii*.
- .243 On *Bathmodon radians*. *Proc. Acad. Nat. Sci. Phila.* Vol. XXIV, 1872, p. 38.  
June 25 Preliminary description.
- .244 Intelligence in Monkeys. *Proc. Acad. Nat. Sci. Phila.* Vol. XXIV, 1872, pp. 40, 41. Abstract, *Amer. Nat.* Vol. VI, 1872, pp. 371, 372.  
June 25
- .245 Report on the Wyandotte Cave and its Fauna. *Amer. Nat.* Vol. VI, 1872, pp. 406-422, figs. 109-116. *Third and Fourth Ann. Rept. Geol. Survey Indiana*, 1871-1872, pp. 157-182, figs. 109-116. *Nature*, Vol. VII, 1872, pp. 11-14, figs. 1-8. Abstract, "Observations on Wyandotte Cave and its Fauna," *Eighth, Ninth and Tenth Ann. Rept. Geol. Survey Indiana*, 1876-77-78, pp. 489-506, figs. 109-116.  
July Includes descriptions of species from the Mammoth Cave. *Amblyopsis spelaeus* the only fish.
- .246 The Anæsthetic School. *Amer. Nat.* Vol. VI, 1872, pp. 431, 432.  
July Abstract of 259.

.247 A New Genus of Ungulates. *Amer. Nat.* Vol. VI, 1872,  
July p. 438.  
Abstract of 266.

.248 Food of *Plesiosaurus*. *Amer. Nat.* Vol. VI, 1872, p. 439.  
July Abstract of 260.

.249 On a new Genus of *Pleurodira* from the Eocene of Wyo-  
July ming. *Proc. Amer. Philos. Soc.* Vol. XII, 1872, pp. 472-477.  
11 *Notomorpha* gen. nov., 3 species, and "*Notharctus*" *vasac-*  
*ciensis* (= *Eohippus*). For date see *Pal. Bull.*, No. 12, p. 3.

.250 Descriptions of Some New Vertebrata from the Bridger  
July Group of the Eocene. *Proc. Amer. Philos. Soc.* Vol. XII,  
29 1872, pp. 460-465. *Pal. Bull.* No. 1, pp. 1-6.

This bulletin includes first descriptions of *Mesonyx* and several new *Chelonia*.

This is the first of a series of notices describing new genera and species of fossil vertebrates discovered by Professor Cope or his assistants during his expeditions for the Hayden Survey in 1872 and 1873. The descriptions were written in the field and forwarded by mail (in two instances by telegraph) to Philadelphia for immediate publication. They are in large part transcripts from his field notebooks which are preserved in the files of the American Museum.

Their purpose was in part to anticipate the work of Professor Marsh, who was known to be studying fossil faunas of the same regions, and between whom and Cope there was a growing rivalry. They precipitated a bitter controversy, turning mainly on the correctness of the stated dates of publication. Professor Cope, in reply to Marsh's claim that the papers were seriously antedated published sworn statements from the printers that the papers were printed and delivered as dated, and somewhat less conclusive evidence as to the distribution of the separata to scientific institutions or individuals within a few days of the stated dates.

Although Professor Marsh failed to retract his charges, it is clear from this evidence, coupled with the internal evidence afforded by close study of the papers, comparison with field notebooks and other considerations that the bulletins were printed and, in most cases if not all, some copies were distributed approximately at the printed dates of publication. Any intentional antedating is out of the question. Under the circumstances it appears wholly proper to accept the accuracy of the dating.

W. D. M.

- .251 The Life of the Plains. *Southern Mag.* N. S. Vol. IV,  
Aug. 1872, pp. 146-155.
- .252 Second Account of New Vertebrata from the Bridger  
Aug. Eocene. *Proc. Amer. Philos. Soc.* Vol. XII, 1872, pp. 466-  
3 468. *Pal. Bull.* No. 2, pp. 1-3.  
First descriptions of *Helotherium* (= *Orohippus* Marsh of identical date), *Stypolophus* (= *Sinopa* Leidy), *Pantolestes*, *Pseudotomus* (here referred to *Edentata* but in fact a rodent allied to *Paramys* Leidy) *Hadrianus* (earliest land tortoise).
- .253 Third Account of New Vertebrata from the Bridger Eocene  
Aug. of Wyoming Territory. *Proc. Amer. Philos. Soc.* Vol. XII,  
7 1872, pp. 469-472. As "Third Account of New Vertebrata from the Bridger Eocene of Wyoming Valley," *Pal. Bull.* No. 3, pp. 1-4.  
First descriptions of *Miacis*, *Tomitherium* (= *Northarctus* Leidy), etc.
- .254 On the Existence of Dinosauria in the Transition Beds of  
Aug. Wyoming. *Proc. Amer. Philos. Soc.* Vol. XII, 1872, pp.  
12 481-483. *Pal. Bull.* No. 4, pp. 1, 2.  
First description of *Agathaumas*.
- .255 Telegram Describing Extinct Proboscidiens found in Wyo-  
Aug. ming. *Pal. Bull.* No. 5.  
19 "*Lefalophodon*," (intended for *Loxolophodon*) with three species, also badly misspelled. The telegram was evidently sent upon discovery of the fine skull which is the type of *Eobasileus cornutus* by Professor Cope at Haystack Mountain in the Washakie basin. It is the first published announcement of his Dinocerata discoveries, but they are here referred to the genus *Loxolophodon* based upon a Coryphodont from the Lower Eocene. With conjectural corrections of specific names. See 286.
- .256 Notices of New Vertebrata from the Upper Waters of Bit-  
Aug. ter Creek, Wyoming Territory. *Proc. Amer. Philos. Soc.*  
20 Vol. XII, 1872, pp. 483-486. *Pal. Bull.* No. 6, pp. 1-4.  
Abstract, "The Proboscidiens of the American Eocene" *Amer. Nat.* Vol. VI, 1872, pp. 773, 774.  
First description of *Synoplotherium* and *Eobasileus*. The relationship of the former to *Mesonyx* was not yet recognized; it was thought to be allied to *Anchippodus* (*Tillodontia*), the enlarged canine being mistaken for an incisor.  
The new genus *Eobasileus* is here based upon the species *cornutus* with a number of fragmentary specimens as types, not including the fine skull which is the type in the telegram



from Black Buttes, written later than this notice but published earlier (see No. 255). Errors of transmission in the telegram being corrected, and the stated dates of publication being accepted, the type specimen of *cornutus* is the complete skull and the monotypic genus *Eobasileus* rests upon this species. It may be remarked incidentally that neither the original type of *Tinoceras* Marsh nor the skull subsequently used by him as a neotype of the genus is congeneric with *Eobasileus*.

- .257 Second Notice of Extinct Vertebrates from Bitter Creek, Aug. Wyoming. *Proc. Amer. Philos. Soc.* Vol. XII, 1872, pp. 22 487, 488. *Pal. Bull.* No. 7, pp. 1, 2.  
 Chiefly an extended account of the discoveries noticed in the telegram from Black Buttes, published a few days earlier.
- .258 On the Horns of *Cariacus virginianus*. *Proc. Acad. Nat. Sept. Sci. Phila.* Vol. XXIV, 1872, p. 124.  
 3
- .259 On different Schools of Naturalists. *Proc. Acad. Nat. Sci. Sept. Phila.* Vol. XXIV, 1872, pp. 124, 125.  
 3 See 246 for abstract.
- .260 Description of *Plesiosaurus gulo* and the Turtle afterwards Sept. named *Toxochelys latiremis*. *Proc. Acad. Nat. Sci. Phila.* Vol. XXIV, 1872, pp. 127-129.  
 3 See 248 for abstract.
- .261 Remarks on *Mastodon* from New Mexico. *Proc. Acad. Nat. Sept. Sci. Phila.* Vol. XXIV, 1872, p. 142.  
 3
- .262 Catalogue of the Pythonomorpha found in the Cretaceous Sept. Strata of Kansas. *Proc. Amer. Philos. Soc.* Vol. XII, 1871, pp. 264-287.  
 30 Descriptions of several characteristic species of Mosasaurs from the Kansas chalk: *Edestosaurus* (= *Clidastes*) *tortor* and *stenops*, *Holcodus* (= *Platecarpus*) *coryphaeus*, *Liodon* (= *Tylosaurus*) *proriger* and *dyspelor*, etc. The first page only appeared in the previous number of the Proc.
- .263 On a New Testudinate from the Chalk of Kansas. *Proc. Sept. Amer. Philos. Soc.* Vol. XII, 1872, pp. 308-310.  
 30 Description of *Cynocercus incisus* gen. et sp. nov. (based on caudal vertebræ, ? *Toxochelys*) and of *Hyposaurus webbi*, crocodilian, the latter from the Benton shales. For abstract, see 229.

- .264   Remarks on Mr. Price's "Phases of Modern Philosophy."  
Sept.   *Proc. Amer. Philos. Soc.* Vol. XII, 1872, pp. 316-320.  
30       For abstract, see 233.
- .265   On the Families of Fishes of the Cretaceous Formation of  
Sept.   Kansas. *Proc. Amer. Philos. Soc.* Vol. XII, 1872, pp. 327-357.  
30       Revision of the genera and species with descriptions of six-  
teen species. For abstract, see 230.
- .266   On *Bathmodon*, an Extinct Genus of Ungulates. *Proc. Amer.*  
Sept.   *Philos. Soc.* Vol. XII, 1872, pp. 417-420.  
30       First description of *Coryphodon* remains from the Evanston  
(Wyoming) Wasatch. Referred here to the *Perissodactyla*.  
The material studied included upper teeth and various frag-  
ments of the skeleton, but no lower molars, and the affinity to  
the European genus *Coryphodon* Owen, then known chiefly  
from the lower teeth, was naturally not recognized. The name  
*Loxolophodon*, subsequently used for a genus of *Unitatheriida*,  
was here first proposed tentatively for *B. semicinctus*, a second  
species of *Bathmodon*, in case it should prove generically  
distinct. For abstract, see 247. The paper was read Feb.  
16, 1872. In case the date of publication is really as late as  
September the genera *Bathmodon* and *Loxolophodon* will date  
from No. 213.
- .267   On Two New Ornithosaurians from Kansas. *Proc. Amer.*  
Sept.   *Philos. Soc.* Vol. XII, 1872, pp. 420-422.  
30       The Kansas pterodactyles are recognized as belonging to  
the genus *Ornithocheirus* Seeley, typically from the English  
chalk and greensand. Two new species *O. umbrosus* and  
*harpyia* described. For abstract, see 232.
- .268   A Description of the Genus *Protostega*, a form of Extinct  
Sept.   Testudinata. *Proc. Amer. Philos. Soc.* Vol. XII, 1872, pp.  
30       422-433.  
First description of the gigantic marine Cretaceous turtle  
*Protostega* based on remains from the Kansas chalk now in  
the American Museum collections. *Atlantochelys* and *Pneu-  
matarthus* referred to the same group. For abstract, see 231.
- .269   The Peculiar Coloration of Fishes. *Amer. Nat.* Vol. VI,  
Oct.   1872, p. 637.  
Color changes due to contraction and expansion of chro-  
matophores.
- .270   On a New Vertebrate Genus from the northern part of the  
Oct.   Tertiary Basin of Green River. *Proc. Amer. Philos. Soc.*  
12       Vol. XII, 1872, p. 554. *Pal. Bull.* No. 8, p. 1.

*Anaptomorphus acmulus*. First record of a recognized primate from the North American Eocene.

- .271 Descriptions of New Extinct Reptiles from the Upper Green River Eocene Basin, Wyoming. *Proc. Amer. Philos. Soc.* Vol. XII, 1872, pp. 554, 555. *Pal. Bull.* No. 9, p. 1.  
 Oct. 12  
 Three new species described: *Crocodylus subulatus* and *sulciferus*, *Anostira radulina*.
- .272 The Geological Age of the Coal of Wyoming. (Read before A. A. A. S.) *Amer. Nat.* Vol. VI, 1872, pp. 669-671.  
 Nov.
- .273 Absence of Eyes in Classification. *Amer. Nat.* Vol. VI, 1872, pp. 691, 692.  
 Nov.
- .274 The Eocene Genus *Synplotherium*. (Read before A. A. A. S.) *Amer. Nat.* Vol. VI, 1872, p. 695.  
 Nov.
- .275 The Armed Metalophodon. *Amer. Nat.* Vol. VI, 1872, pp. 774, 775.  
 Dec.  
 Abstract of 285.
- .276 The Fish Beds of Osino, Nevada. *Amer. Nat.* Vol. VI, December 1872, p. 775.  
 Dec.  
 Abstract of 284.
- .277 On the Geology of Wyoming. *Proc. Acad. Nat. Sci. Phila.* Vol. XXIV, 1872, pp. 279, 280. *Pal. Bull.* No. 10, pp. 1, 2.  
 Dec. 19
- 1873.278 On the Extinct Vertebrata of the Eocene of Wyoming observed by the Expedition of 1872, with notes on the Geology. *Sixth Ann. Report, U. S. Geol. Survey of the Territories embracing . . . Montana*, etc. (Hayden) pp. 545-649, Pls. I-VI.
- .279 Sketch of the Zoology of Ohio. *Walling and Gray's New Topographical Atlas of Ohio*, pp. 25-27.
- .280 Sketch of the Zoology of Maryland. *Walling and Gray's New Topographical Atlas of Maryland*, pp. 16-18.
- .281 Proboscidians of the American Eocene. Correction. *Amer. Nat.* Vol. VII, 1873, p. 49.  
 Jan.  
 Correction regarding the teeth of *Eobasilus cornutus*—Hay.
- .282 On Two New Perissodactyles from the Bridger Eocene. *Pal. Bull.* No. 11, pp. 1, 2.  
 Jan.
- 31 Two species of *Palaeosyopina*. An extended form of an article of the same title appearing in *Proc. Amer. Philos. Soc.* Vol. XIII, pp. 35, 36.

- .283 The Slaughter of the Buffalo. *Amer. Nat.* Vol. VII, 1873,  
Feb. pp. 113, 114.
- .284 On the Tertiary Coal and Fossils of Osino, Nevada. *Proc.*  
Feb. *Amer. Philos. Soc.* Vol. XII, 1872, pp. 478-481.  
7 For abstract, see 276. *Trichophanes hians* and *Amyzon  
mentoli* new genera and species.
- .285 On the Dentition of *Metalophodon*. *Proc. Amer. Philos.*  
Feb. *Soc.* Vol. XII, 1872, pp. 542-545.  
7 For abstract, see 275. Description of *Metalophodon arma-  
tus* and *Alligator heterodon* from Black Buttes Eocene.
- .286 Notice of Proboscidiens from the Eocene of Southern Wyo-  
Feb. ming. *Proc. Amer. Philos. Soc.* Vol. XII, 1872, p. 580.  
7 Followed by note of the secretary correcting errors in the  
original which was issued as Pal. Bull. No. 5 (See, 1872  
.255). Corrected version of telegram describing *Loxolopho-  
don*.
- .287 On an Extinct Genus of Saurodont Fishes from the Nio-  
Feb. brara Cretaceous of Kansas. *Proc. Acad. Nat. Sci. Phila.*  
Vol. XXIV, 1872, pp. 280, 281.  
11 *Erisichthe* close to *Ichthyodectes* and *Portheus*.
- .288 Note on the Cretaceous of Wyoming. *Amer. Journ. Sci.*  
March Ser. 3, Vol. V, 1873, pp. 230, 231.  
Slip from the "Proc. Philos. Soc., Philadelphia," pub-  
lished on Feb. 7. Followed by remarks by "Eds." The  
original not found in the Proc. Amer. Philos. Soc.—Hay.
- .289 The Gigantic Mammals of the Genus *Eobasileus*. *Amer.*  
March *Nat.* Vol. VII, 1873, pp. 157-160. Read before A. A. A. S.
- .290 The Spike-horned Muledeer. *Amer. Nat.* Vol. VII, 1873,  
March pp. 169, 170.
- .291 The *Eobasileus* again. *Amer. Nat.* Vol. VII, 1873, p. 180.  
March
- .292 On *Toxochelys latiremis*. *Proc. Acad. Nat. Sci. Phila.* Vol.  
March XXV, 1873, p. 10.  
4 No description.
- .293 On the Structure and Systematic Position of the Genus  
March *Eobasileus* Cope. *Proc. Acad. Nat. Sci. Phila.* Vol. XXV,  
1873, pp. 10-12.  
4 Discussion of ordinal characters and relationships of Probo-  
scidea.

- .294 On some Eocene Mammals obtained by Hayden's Geological  
 March Survey of 1872. *Pal. Bull.* No. 12, pp. 1-6.  
 8 Partial annotated list of species from the Bridger Basin  
 with description of *Oligstomus* gen. nov. and five new species  
 of mammalia. Issued privately March 8, not reprinted—Hay.
- .295 Dawson on Evolution. *Independent* Vol. XXV, 1873, p.  
 March 328.  
 13
- .296 On the Short Footed Ungulata of the Eocene of Wyoming.  
 March *Proc. Amer. Philos. Soc.* Vol. XIII, 1873, pp. 38-74, Pls.  
 14 1-4. Extract, *Journ. de Zoologie*, Vol. II, 1873, pp. 168-  
 184, Pl. VII, followed by remarks by Paul Gervais (Hay).  
 Revision of the Uintatheriidae and Coryphodontidae. Dates  
 of earlier notices descriptive of Eocene vertebrata. Separate  
 March 14, 1873. Date taken from Miss Brown's MSS.
- .297 On *Eobasilidae* and *Bathmodontidae*. *Proc. Acad. Nat. Sci.*  
 March *Phila.* Vol. XXV, 1873, pp. 102, 103.  
 25 Key to genera.
- .298 A New Theory of the Origin of Species (Review). *Amer.*  
 April *Nat.* Vol. VII, 1873, pp. 231, 232.
- .299 On some of Prof. Marsh's Criticisms. *Amer. Nat.* Vol.  
 April VII, 1873, pp. 290-299, Pls. 4, 5.  
 For extended form, see 306.
- .300 Aztec Design. *Independent* Vol. XXV, 1873, p. 454.  
 April  
 10
- .301 On a Skull of *Sus scropha*. *Proc. Acad. Nat. Sci. Phila.*  
 April Vol. XXV, 1873, p. 207.  
 29 Supposed fossil from North Carolina.
- .302 On an Anourous Batrachian from the Eocene of Wyoming.  
 April *Proc. Acad. Nat. Sci. Phila.* Vol. XXV, 1873, p. 207.  
 29 From Green River shale. Notice.  
 No name or description.
- .303 On the Tusk of *Loxolophodon cornutus*. *Amer. Nat.* Vol.  
 May VII, 1873, p. 315.
- .304 On the Primitive Types of the Orders of Mammalia *Educa-*  
 May *bilia*. Read before the Amer. Philos. Soc., April 18, 1873,  
 6 printed and then withdrawn on June 20, 1873. A few sepa-  
 rates still in existence. Separate May 6, 1873.  
 Discussion of the broader affinities of the Eocene mammals,  
 especially those recently discovered in the Bridger Basin.

- .305 Memory and Reminiscence in Animals. *Independent Vol.*  
June XXV, 1873, p. 710.  
5
- .306 On some of Prof. Marsh's Criticisms. *Pal. Bull.* No. 13, pp.  
July 1-8.  
A slightly extended form of 299.
- .307 On Prof. Marsh's Criticism. *Amer. Nat.* Appendix to July  
July p. i (8 lines only.)
- .308 Extinct Turtles from the Eocene Strata of Wyoming. *Proc.*  
July *Acad. Nat. Sci. Phila.* Vol. XXV, 1873, pp. 277-279.  
8 *Trionyx heteroglyptus* and *Plastomenus thomasi* from  
Bridger formation.
- .309 Palaeontological Bulletin—Preliminary. 2 pp. (Gives titles  
July and dates of Palaeontological Bulletins 1-13.)  
16
- .310 A Contribution to the Ichthyology of Alaska. *Proc. Amer.*  
July *Philos. Soc.* Vol. XIII, 1873, pp. 24-32.  
24 Fourteen species described, eleven new.
- .311 On the Flat-Clawed Carnivora of the Eocene of Wyoming.  
July *Proc. Amer. Philos. Soc.* Vol. XIII, 1873, pp. 198-209.  
24 Description of *Mesonyx* and *Synoplotherium* and discus-  
sion of their affinities.
- .312 On the Osteology of the Extinct Tapiroid *Hyrachyus*. *Proc.*  
July *Amer. Philos. Soc.* Vol. XIII, 1873, pp. 212-224.  
24 Description of the complete skelton of *Hyrachyus* found  
by Professor Cope in the Bridger Basin in 1872.
- .313 On some New Extinct Mammalia from the Tertiary of the  
July Plains. *Pal. Bull.* No. 14, pp. 1, 2.  
25 First bulletin descriptive of discoveries made by Professor  
Cope in the Tertiary (Oligocene and Miocene) of north-  
eastern Colorado in 1873. Like the preceding series these  
were apparently sent in from the field and are in con-  
siderable part transcripts from his field notebooks. De-  
scribes *Aclurodon* (= *Martes*) *mustelinus* and *Aceratherium*  
(= *Aphelops*) *megalodus*, both from the Miocene (Pawnee  
Creek beds) near Pawnee Buttes.
- .314 On a Habit of a Species of *Blarina*. *Amer. Nat.* Vol. VII,  
Aug. 1873, pp. 490, 491.
- .315 The Monster of Mammoth Buttes. *Penn Monthly*, Vol. IV,  
Aug. 1873, pp. 521-534, Plate.

- .316 Second Notice of Extinct Vertebrata from the Tertiary of  
 Aug. the Plains. *Pal. Bull.* No. 15, pp. 1-6.  
 20 Describes various Oligocene (White River) fossils from  
 northeastern Colorado. *Colotaxis* gen. nov. (= *Ischyromys*),  
*Symborodon* and *Miobasileus* Titanotheriidae, *Peltosaurus* and  
 four species of *Testudo*.
- .317 Third Notice of Extinct Vertebrata from the Tertiary of  
 Aug. the Plains. *Pal. Bull.* No. 16, pp. 1-8.  
 20 Describes Oligocene (White River) mammals, chiefly In-  
 sectivora and Rodents. Nine new genera.
- .318 On Two New Species of Saurodontidae. *Proc. Acad. Nat.*  
 Sept. *Sci. Phila.* Vol. XXV, 1873, pp. 337-339.  
 30 *Portheus lestrio* and *P. gladius* described and *Daptinus* N.  
 Gen. established.
- .319 On some New Batrachia and Fishes from the Coal Measures  
 Sept. of Linton, Ohio. *Proc. Acad. Nat. Sci. Phila.* Vol. XXV,  
 30 1873, pp. 340-343.  
 Three species of *Couchiopsis* and one of *Peplorhina*.
- .320 Synopsis of New Vertebrata from the Tertiary of Colorado  
 Oct. obtained during the summer of 1873. Pp. 1-19. Govt. Print-  
 16 ing Office.  
 On the title page this paper is said to be extracted from  
 the Seventh Annual Report of the U. S. Geological Survey  
 of the Territories, but it does not appear in that volume.—  
 Hay.
- .321 Fourth Notice of Extinct Vertebrata from the Bridger and  
 Oct. the Green River Tertiary. *Pal. Bull.* No. 17, pp. 1-4.  
 25 *Achænodon* and *Phænacodus*, new genera.
- .322 Some remarkable and gigantic Animals. *Independent* Vol.  
 Oct. XXV, 1873, p. 1351.  
 30 Unsigned. Cited by Frazer.
- 1874.323 Report on the Vertebrate Palaeontology of Colorado. *Seventh*  
*Ann. Report, U. S. Geol. and Geogr. Survey of the Terri-*  
*tories* (embracing Colorado), pp. 427-533, Pls. I-VIII. Ab-  
 stract, *Journ. de Zoologie* Vol. IV, 1875, pp. 354-359.  
 One species described; *Rhineastis*, *Amyzon*, *Cluæa*.
- .324 Notes on the Eocene and Pliocene Lacustrine Formations of  
 New Mexico, including Descriptions of certain New Species  
 of Vertebrates. *Ann. Report of the Chief of Engineers for*  
 1874 Vol. II, Pt. II, Appendix FF<sup>3</sup> of Appendix FF, pp.  
 115-130.  
 For the original title and first date of issue see 358.

- .325 On some Extinct Types of Horned Perissodactyles. *Proc. A. A. A. S.* XXII Meeting, 1873, pp. 108, 109. *Canadian Naturalist* Vol. VII, pp. 169-171. *Ann. & Mag. Nat. Hist.* Ser. 4, Vol. XIII, 1874, pp. 405, 406.
- .326 The Doctrine of the Inner Light. *The Journal* (Published for Ye Society of Friends), 1874, pp. 1-7.
- .327 On Stone Circles in the Rocky Mountains. *Proc. Acad. Nat. Sci. Phila.* Vol. XXV, 1873, p. 370.  
Jan. 13
- .328 On the Types of Molar Teeth. *Proc. Acad. Nat. Sci. Phila.* Vol. XXV, 1873, p. 371.  
Jan. 13  
Outline of No. 335.
- .329 Report on the Stratigraphy and Pliocene Vertebrate Palaeontology of Northern Colorado. *Bull. U. S. Geol. and Geogr. Survey of the Territories*, Ser. 1, No. 1, pp. 9-22.  
Jan. 21
- .330 Supplementary additions to the "Synopsis of New Vertebrata from the Tertiary of Colorado, 1873." *Bull. U. S. Geol. and Geogr. Survey of the Territories*, Ser. 1, No. 1, pp. 22-28.  
Jan. 21
- .331 Monkeys in the American Miocene. *Amer. Nat.* Vol. VIII, 1874, pp. 125, 126.  
Feb. *Menotherium lemuringum*; no description. Skeleton of *Protohippus sejunctus*.
- .332 The Succession of Life in North America. *Penn Monthly* Vol. V, 1874, pp. 138-145. Reprint, *Ann. & Mag. Nat. Hist.* Ser. 4, Vol. XIII, 1874, pp. 326-331.  
Feb.
- .333 On Fishes from the Coal Measures of Linton, Ohio. *Proc. Acad. Nat. Sci. Phila.* Vol. XXV, 1873, pp. 417-419.  
Feb. 17  
*Conchiopsis* and *Peplorhina* are fishes not amphibians or reptiles as thought by Newberry.
- .334 On Fossils from the Miocene Formations of Colorado. *Proc. Acad. Nat. Sci. Phila.* Vol. XXV, 1873, pp. 419, 420.  
Feb. 17  
*Menotherium lemuringum* a primate. Notice of other species from Pawnee Buttes. No adequate description.
- .335 On the Homologies and Origin of the Types of Molar Teeth of Mammalia *Educabilia*. *Journ. Acad. Nat. Sci. Phila.* Ser. 2, Vol. VIII, 1874, pp. 71-89, figs. 1-29.  
March 30  
Abstract, No. 328. Separates March 30, 1874.
- .336 Review of the Vertebrata of the Cretaceous Period found West of Mississippi River. Section I—On the Mutual Relations of the Cretaceous and Tertiary Formations of the West.  
April 9



- Section II—List of Species of Vertebrata from the Cretaceous Formations of the West. *Bull. U. S. Geol. and Geogr. Survey of the Territories*, Ser. I, No. 2, pp. 5-48.
- .337  
April  
9  
Supplementary Notices of Fishes from the Freshwater Tertiaries of the Rocky Mountains. *Bull. U. S. Geol. and Geogr. Survey of the Territories*, Ser. I, No. 2, pp. 49-51.  
*Rhineastis pectinatus*, *Amyzon commune* and *Clupea theta* new species.
- .338  
April  
13  
On the *Plagopterinæ* and the Ichthyology of Utah. *Proc. Amer. Philos. Soc.* Vol. XIV, 1874, pp. 129-139.  
Reprint April 13, 1874—date from Miss Brown's MSS. *Plagopterus*, *Meda*, and *Lipomeda*, new fossil genera with 3 species. Twelve freshwater fishes (5 new species) from Lake Utah. Eight species (5 new) from streams in Utah and Arizona.
- .339  
April  
13  
On the Zoology of a Temporary Pool on the Plains of Colorado. *Proc. Amer. Philos. Soc.* Vol. XIV, 1874, pp. 139, 140.  
Reprints April 13, 1874—date from Miss Brown's MSS.
- .340  
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On the Extinct Fauna of Colorado. *Proc. Acad. Nat. Sci. Phila.* Vol. XXVI, 1874, pp. 10, 11.  
Discussion by Cope, LeConte and Frazer on age of "lignite" beds of N. E. Colorado.
- .341  
April  
28  
On the Age of the Lignites of the West. (Observations on the age of lignite and other formations of the West—Hay). *Proc. Acad. Nat. Sci. Phila.* Vol. XXVI, 1874, pp. 10-13.
- .342  
May  
Beale on Protoplasm (Review of *Protoplasm, or Matter and Life* by Dr. Lionel Beale). *Penn Monthly* Vol. V, 1874, pp. 377-388.
- .343  
May  
19  
Description of some Species of Reptiles obtained by Dr. John F. Bransford, Assistant Surgeon United States Navy, while attached to the Nicaraguan Surveying Expedition in 1873. *Proc. Acad. Nat. Sci. Phila.* Vol. XXVI, 1874, pp. 64-72.
- .344  
July  
A New Type of Snake. *Amer. Nat.* Vol. VIII, 1874, p. 432.  
*Genhosteus prosopis* from Peru.
- .345  
July  
A Horned *Elotherium*. *Amer. Nat.* Vol. VIII, 1874, p. 437.  
*E. ramosum* "horns" on lower jaw.
- .346  
Aug.  
18  
On a young *Balæna cisarctica*. *Proc. Acad. Nat. Sci. Phila.* Vol. XXVI, 1874, p. 89.

- .347 On the Extinct Mammalia of Colorado. (Remarks on *Sym-*  
 Aug. *borodon*, *Titanotherium*, and *Eobasileus*.—Hay). *Proc. Acad.*  
 18 *Nat. Sci. Phila.* Vol. XXVI, 1874, pp. 89, 90.  
 Notice of exhibition of *Symborodon* crania.
- .348 On the Pelvis of *Hadrosaurus*. *Proc. Acad. Nat. Sci. Phila.*  
 Aug. Vol. XXVI, 1874, p. 91.  
 18 Critical comment on views of Hawkins and Leidy. Three  
 lines.
- .349 On the Genus *Ctenodus*. *Proc. Acad. Nat. Sci. Phila.* Vol.  
 Aug. XXVI, 1874, pp. 91, 92.  
 18 Description of bones of head—no species assigned.
- .350 Remarks on Viviparous Snakes of the Genus *Storeria* B. &  
 Sept. G. *Proc. Acad. Nat. Sci. Phila.* Vol. XXVI, 1874, p. 116.  
 29 First notice of the genus as viviparous.
- .351 On the Age of the Bridger Eocene. *Proc. Acad. Nat. Sci.*  
 Sept. *Phila.* Vol. XXVI, 1874, p. 116.  
 29 Middle Eocene, older than Parisian.
- .352 On the Palæontology of Colorado. (Synopsis of result of  
 Sept. work in connection with Hayden's U. S. Geological Survey  
 29 during 1873.—Hay). *Proc. Acad. Nat. Sci. Phila.* Vol. XXVI,  
 1874, pp. 116, 117.
- .353 On some Batrachia and Nematognathi brought from the  
 Sept. Upper Amazon by Professor Orton. *Proc. Acad. Nat. Sci.*  
 29 *Phila.* Vol. XXVI, 1874, pp. 120-137.  
 Describing two new batrachian genera, *Bubonias* and  
*Dysichthys*. Seventeen Nematognathi listed, seven described  
 as new.
- .354 Remarks on *Brontotherium*. (Remarks of Professor Marsh's  
 Oct. *Brontotherium ingens*.—Hay). *Proc. Amer. Philos. Soc.*  
 2 Vol. XIV, 1874, p. 2.  
 Synonym of *Symborodon trigonoceras*.
- .355 Remarks on *Eobasileus galeatus* and on a Fossil Walrus.  
 Oct. *Proc. Amer. Philos. Soc.* Vol. XIV, 1874, pp. 17, 18.  
 2 Exhibition of fragmentary skull and of walrus skull from  
 Accomac, Va.
- .356 Abstract of Remarks of Professor Cope at the Meeting of  
 Oct. the American Philosophical Society, January 16, 1874. *Proc.*  
 2 *Amer. Philos. Soc.* Vol. XIV, 1874, p. 110.  
*Poëbrotherium*, an ancestor of the Camelidæ.
- .357 Notes on the Santa Fé Marls, and some of the contained  
 Oct. Vertebrate Fossils. *Proc. Acad. Nat. Sci. Phila.* Vol. XXVI,  
 20 1874, pp. 147-152. *Pal. Bull.* No. 18, pp. 147-152.  
 Six new species described: *Panolax* new genus.

- .358 Report upon the Vertebrate Fossils discovered in New Mexico  
 Nov. with Descriptions of New Species. Note from Miss Brown's  
 28 MSS. Issued as a separate (pp. 1-18) on November 28.  
 The same paper as 324.
- .359 Extract of a Letter from Nacimiento, New Mexico. *Proc.*  
 Dec. *Acad. Nat. Sci. Phila.* Vol. XXVI, 1874, p. 163.  
 15 Notice of archaeological discoveries.
- 1875.360 Supplement to the Extinct Batrachia and Reptilia of North  
 America. I—Catalogue of the Air-breathing Vertebrata from  
 the Coal Measures of Linton, Ohio. *Trans. Amer. Philos.*  
*Soc.* n. s. Vol. XV, 1874, pp. 261-278.
- .361 The Vertebrata of the Cretaceous Formations of the West.  
*Report, U. S. Geological Survey of the Territories* (Hay-  
 den) Vol. II, pp. 1-303, Pls. I-LVII and figs. 1-10 (4to.).  
 For a slightly changed form of pp. 7-14, see 375.
- .362 On the Fishes of the Tertiary Shales of the South Park.  
*Bull. U. S. Geol. and Geogr. Survey of the Territories*, Ser.  
 II, No. 1, pp. 3-5.
- .363 Report on the Geology of that Part of Northwestern New  
 Mexico examined during the field season of 1874. *Ann.*  
*Report upon the Geogr. Explorations and Surveys West of*  
*the 100th Meridian . . .* (Wheeler). Being Appendix  
 LL of the Annual Report, Chief of Engineers for 1875, pp.  
 961-1097, Pls. II, V, VI, figs. 1-18. When Appendix LL, etc.  
 was issued as a separate the pagination was pp. 61-116.
- .364 Report on the Remains of a Population observed on and  
 near the Eocene Plateau of Northwestern New Mexico.  
*Ann. Report upon the Geogr. and Geol. Explorations and*  
*Surveys West of the 100th Meridian . . .* (Wheeler), pp.  
 166-173, figs. 1-6. (Exactly the same text as 408. The  
 figures are lacking in the former.)
- .365 [Synopsis of the Genera *Crotalus* and *Eutaenia*, together  
 with descriptions of one New Genus and Seven New Spe-  
 cies]. Report upon the Collections of Batrachians and Rep-  
 tiles made in portions of Nevada . . . during the years,  
 1871, 1872, 1873, 1874 by Dr. H. C. Yarrow. *Report, U. S.*  
*Geogr. Surveys West of the 100th Meridian . . .*  
 (Wheeler) Vol. V, Chap. IV, pp. 532-536. (Material in-  
 serted in Yarrow's Chapter.) (4to.)  
 New genus is *Chilopoma* (preoccupied) now a synonym of  
*Thamnophis*.
- .366 Report upon the Collection of Fishes made in Portions of  
 Nevada, Utah, California, Colorado, New Mexico and Arizona

during the years 1871, 1872, 1873 and 1874. (With H. C. Yarrow.) *Report, Geogr. and Geol. Explor. and Surveys West of the 100th Meridian* (Wheeler) Vol. V, Chapter VI, pp. 630-703, Pls. XXVI-XXXII (4to.).

Systematic arrangement with descriptions of all the fishes collected by all the naturalists of all the expeditions working in the states during the years named. Several new species are described.

- .367 Check-List of North American Batrachia and Reptilia; with a Systematic List of the Higher Groups, and an Essay on Geographical Distribution, based on the specimens contained in the U. S. National Museum. *Bull. U. S. Nat. Museum*, No. 1, pp. 1-104.
- .368 Synopsis of the Vertebrata whose Remains have been preserved in the Formations of North Carolina. *Rept. Geol. Survey, North Carolina*, W. C. Kerr, State Geologist, Appendix B., pp. 29-52, Pls. V-VIII.
- .369 Synopsis of the Extinct Batrachia from the Coal Measures. *Rept. Geol. Survey Ohio* Vol. II (Palaeontology) Pt. II, pp. 349-411, Pls. XXVI-XLV, figs. 1-11.
- .370 Report on the Vertebrate Fossils from the Fort Union Groups of Milk River. *Report* (of the British North American Boundary Commission), *on the Geology and Resources of the Region in the Vicinity of the 49th Parallel* (Dawson), Appendix B., pp. 333-337.
- .371 New Forms of *Elasmosauridæ*. *Amer. Nat.* Vol. IX, 1875, p. 55.  
Jan. Review of Seeley.
- .372 American Types in the Cretaceous of New Zealand. *Amer. Nat.* Vol. IX, 1875, pp. 55, 56.  
Jan. Review of Hector.
- .373 A New Mastodon. *Amer. Nat.* Vol. IX, 1875, p. 56.  
Jan. *M. productus* from Sante Fe—no description.
- .374 The Wheeler Geological Survey of New Mexico for 1874. *Amer. Nat.* Vol. IX, 1875, pp. 49-52.  
Jan. Abstract report of Cope's party.
- .375 The Value of Palaeontology. (The Significance of Palaeontology—Cover Title.) *Penn Monthly*. Vol. VI, pp. 55-62.  
Jan. A very slightly changed form of the introduction in 361.

- .376 On a New Mastodon and Rodent. *Proc. Acad. Nat. Sci. Phila.* Vol. XXVI, 1874, pp. 221-223. Abstracts, "A New Mastodon," *Amer. Nat.* Vol. IX, 1875, p. 56.  
 Feb. 2 Description of *Mastodon productus* and *Steneofiber pansus* from Santa Fe bed of New Mexico.
- .377 On the Characters of *Symborodon*. *Proc. Acad. Nat. Sci. Phila.* Vol. XXVI, 1874, p. 224.  
 Feb. 2 Distinction from *Titanotherium*.
- .378 On Dr. Leidy's "Correction". *Proc. Acad. Nat. Sci. Phila.* Vol. XXVI, 1874, pp. 224, 225.  
 Feb. 2 Concerning the relationships of *Thespesius* and *Ischyrosaurus*.
- .379 Note on the Genus *Calamodon*. *Amer. Journ. Sci.* Ser. 3, Vol. IX, 1875, pp. 228, 229.  
 March
- .380 Biological Research in the United States. *Penn Monthly*, Vol. VI, 1875, pp. 202-211.  
 March
- .381 Systematic Catalogue of Vertebrata of the Eocene of New Mexico collected in 1874. *Report, Engineer Department, U. S. Army* in charge of Lieut. Geo. M. Wheeler, pp. 1-37.  
 April 17 Extended report on Wasatch vertebrate fauna with descriptions of twenty-eight new species.
- .382 On the Transition Beds of the Saskatchewan District. *Proc. Acad. Nat. Sci. Phila.* Vol. XXVII, 1875, pp. 9, 10.  
 April 20
- .383 The Herpetology of Florida. *Proc. Acad. Nat. Sci. Phila.* Vol. XXVII, 1875, pp. 10, 11.  
 April 20 Florida as a distinct subdivision of the Austroriparian region.
- .384 The Extinct Batrachia of Ohio. *Proc. Acad. Nat. Sci. Phila.* Vol. XXVII, 1875, p. 16.  
 April 20 *Pleuropteryx clavatus* and *Hyphasma laevis*, new genera and species, described, and a new species of *Ceraterpeton*.
- .385 On Green-Sand Vertebrata. *Proc. Acad. Nat. Sci. Phila.* Vol. XXVII, 1875, p. 19.  
 April 20 Brief notice of crocodilia and chimaeroid fishes.
- .386 On the Homologies of the Sectorial Tooth of Carnivora. *Proc. Acad. Nat. Sci. Phila.* Vol. XXVII, 1875, pp. 20-23.  
 April 20 Application of theories outlined in No. 335 to the evolution of carnassials. Primitive tibio-astragalar articulation in Eocene carnivora.

- .387 The Feet of *Bathmodon*. *Proc. Acad. Nat. Sci. Phila.* Vol. XXVII, 1875, p. 73. Abstract, "On the Order Amblypoda", May 11 *Amer. Nat.* Vol. IX, p. 427.  
Characteristics of feet separate *Bathmodon* and its allies from Proboscidea as a distinct order, Amblypoda, with two suborders, Pintodonta (*Bathmodon*) and Dinocerata (*Uintatherium* and *Loxolophodon*).
- .388 Synopsis of the Vertebrata of the Miocene of Cumberland June 18 County, New Jersey. *Proc. Amer. Philos. Soc.* Vol. XIV, 1875, pp. 361-364.  
List with a few annotations. *Agabelus* gen. nov.
- .389 On some New Fossil Ungulata. *Proc. Acad. Nat. Sci. Phila.* June 28 Vol. XXVII, 1875, pp. 258-261. *Pal. Bull.* No. 19, pp. 1-4.  
Abstract, *Amer. Journ. Sci.* Ser. 3, Vol. X, 1875, p. 153.  
*Pliauchenia* described with two species. *Hippotherium calamarium* and *Aphelops jemezianus* from Santa Fe marls, New Mexico.
- .390 The Geology of New Mexico. *Pal. Bull.* No. 19, pp. 5-8. June 28 Lacks discussion contained in 396, but is otherwise the same.
- .391 On an Indian Kitchenmidden. *Proc. Acad. Nat. Sci. Phila.* July 27 Vol. XXVII, 1875, p. 255.
- .392 On Fossil Lemurs and Dogs. *Proc. Acad. Nat. Sci. Phila.* Vol. XXVII, 1875, pp. 255, 256. July 27 *Sarcolemur* described (Bridger Eocene); *Canis* or *Amphicyon ursinus* from Santa Fe beds.
- .393 On the Antelope-Deer of the Sante Fé Marls. *Proc. Acad. Nat. Sci. Phila.* Vol. XXVII, 1875, p. 257. July 27 '*Dicrocerus*' (= *Merycodus*) from Santa Fe beds. This fauna probably Upper Miocene.
- .394 The Phylogeny of the Camels. *Proc. Acad. Nat. Sci. Phila.* July 27 Vol. XXVII, 1875, pp. 261, 262.  
Evolution of feet and teeth *Poëbrotherium*, *Procamelus*, *Pliauchenia*, *Camelus*, *Auchenia*.
- .395 Consciousness in Evolution. *Penn Monthly.* Vol. VI, 1875, July 31 pp. 560-575.
- .396 The Geology of New Mexico. *Proc. Acad. Nat. Sci. Phila.* Aug. 31 Vol. XXVII, 1875, pp. 263-268, 269. Abstract, *Amer. Journ. Sci.* Ser. 3, Vol. X, 1875, pp. 152, 153.  
A fuller form of 390. Brief note on Mesozoic and Tertiary

- in northern New Mexico, description of *Typhothorax coccinarum*.
- .397 On an Extinct Vulturine Bird. *Proc. Acad. Nat. Sci. Phila.*  
 Aug. Vol. XXVII, 1875, p. 271.  
 31 *Vultur umbrosus* described from Santa Fe marls.
- .398 On the Cretaceous Beds of Gailsteo. *Proc. Acad. Nat. Sci.*  
 Sept. *Phila.* Vol. XXVII, 1875, pp. 359, 360.  
 28
- .399 On the Batrachia and Reptilia of Costa Rica. *Journ.*  
 Nov. *Acad. Nat. Sci. Phila.* Ser. 2, Vol. VIII, 1875, pp. 93-154,  
 26 188, Pls. XXIII-XXVIII. Separates November 26, 1875.  
 New bufoniform genera *Cranopsis*, *Crepidins* and *Ollotis*;  
 lacertilian genus, *Chalcidolepsis*. Synopses of *Conophis*,  
*Coniophanes*, *Rhadimæa*, *Tantilla*, and of the genera related  
 to *Stenorhina*. The footnotes include descriptions of a num-  
 ber of new species from Mexico and the new lacertilian  
 genus *Epaphelus*.
- .400 On the Batrachia and Reptilia collected by Dr. John M.  
 Nov. Bransford during the Nicaraguan Canal Survey of 1874.  
 26 *Journ. Acad. Nat. Sci. Phila.* Ser. 2, Vol. VIII, 1875, pp.  
 155-157. Separates Nov. 26, 1875.
- .401 Report on the Reptiles brought by Prof. James Orton from  
 Nov. the Middle and Upper Amazon, and Western Peru. *Journ.*  
 26 *Acad. Nat. Sci. Phila.* Ser. 2, Vol. VIII, 1875, pp. 159-  
 183. Separates Nov. 26, 1875.  
 Including a new iguanid genus, *Scytomycterus*.
- .402 Note on the Ichthyology of Lake Titicaca. *Journ. Acad.*  
 Nov. *Nat. Sci. Phila.* Ser. 2, Vol. VIII, 1875, pp. 185-187. Sepa-  
 26 rates Nov. 26, 1875.  
*Orestias bairdii* and *O. ortonii* N. Sp.
- .403 The Relation of Man to the Tertiary Mammalia. *Penn*  
 Dec. *Monthly* Vol. VI, 1875, pp. 879-886.  
 Read under the title "Indications of Descent Exhibited by  
 the North American Tertiary Mammalia" before the A. A.  
 A. S. Appears as title only in the Proc. A. A. A. S.
- .404 On Fossil Remains of Reptiles and Fishes from Illinois.  
 Dec. *Proc. Acad. Nat. Sci. Phila.* Vol. XXVII, 1875, pp. 404-411.  
 21 Reprint, *Ann. & Mag. Nat. Hist.* Ser. 4, Vol. VII, 1876, pp.  
 178-184. Abstract, "Interesting Fossils from Illinois", *Amer.*  
*Nat.* Vol. IX, 1875, pp. 573, 574.  
 According to Cope this paper was issued in 1876. See,  
 Cope. 1886.920, p. 286. *Ceratodus vinslooi* Cope.

- .405 On the Supposed Carnivora of the Eocene of the Rocky  
Dec. Mountains. *Proc. Acad. Nat. Sci. Phila.* Vol. XXVII, 1875,  
22 pp. 444-448. *Pal. Bull.* No. 20, pp. 1-4.  
Characters of the Creodonta, proposed as a new suborder  
of Insectivora.
- 1876.406 On the Distribution of Batrachia and Reptilia in North  
America. *Proc. A. A. A. S.* XXIV Meeting, 1875, pp. 197-  
201.
- .407 On a new Genus of Lophobranchiate Fishes. *Proc. Acad.*  
Jan. *Nat. Sci. Phila.* Vol. XXVII, 1875, p. 450, Pl. XXV.  
11 *Osophyolax.*
- .408 On the Remains of Population observed on and near the  
Feb. Eocene Plateau of Northwestern New Mexico. *Proc. Amer.*  
4 *Philos. Soc.* Vol. XIV, 1875, pp. 475-482.  
See 364.
- .409 The Academy of Natural Sciences. *Penn. Monthly* Vol. VII  
March 1876, pp. 173-180.
- .410 On a Gigantic Bird from the Eocene of New Mexico. *Proc.*  
April *Acad. Nat. Sci. Phila.* Vol. XXVIII, 1876, pp. 10, 11. *Amer.*  
18 *Journ. Sci.* Ser. 3, Vol. XII, 1876, p. 306 and 493.  
*Diatryma gigantea.*
- .411 On the Theory of Evolution. *Proc. Acad. Nat. Sci. Phila.*  
April Vol. XXVIII, 1876, pp. 15-17. Reprint, "The Progress of  
18 Discovery of the Laws of Evolution," *Amer. Nat.* Vol. X,  
1876, pp. 218-221. *Amer. Journ. Sci.* Ser. 3, Vol. XII, 1876,  
pp. 309-311.
- .412 On the *Taniodonta*, a New Group of Eocene Mammalia.  
April *Proc. Acad. Nat. Sci. Phila.* Vol. XXVIII, 1876, p. 39.  
25 Partly intermediate between Edentata and Insectivora. Two  
families. Ectoganidæ and Calamodontidæ. *Esthonyx* and  
*Anchippodus* related to *Erimacrus*.
- .413 On the Geologic Age of the Vertebrate Fauna of New  
April Mexico. *Proc. Acad. Nat. Sci. Phila.* Vol. XXVIII, 1876,  
26 pp. 63-66. *Pal. Bull.* No. 21, pp. 1-3. *Journ. de Zoologie* Vol.  
V, 1876, pp. 307-311. *Amer. Journ. Sci.* Ser. 3, Vol. XII,  
1876, pp. 297, 298.  
Review of Wasatch fauna and comparison with Suessonian  
of Europe.
- .414 On some Supposed Lemurine Forms of the Eocene Period.  
July *Proc. Acad. Nat. Sci. Phila.* Vol. XXVIII, 1876, pp. 88, 89.  
11 Suborder, Mesodonta based on combination of Creodont



and Primate characters of 'Tomitherium' of New Mexican Wasatch. [This was due to finding mixed remains of a Creodont and a primate]. Order Bunotheria proposed to include Creodonta, Mesodonta, Insectivora, Tillodonta and Taeniodonta also perhaps Prosimiae.

- .415 Academies of Science. *Penn Monthly*, Vol. VII, 1876, pp. 640-647.  
 Aug.
- .416 On a New Genus of Fossil Fishes. *Proc. Acad. Nat. Sci. Phila.* Vol. XXVIII, 1876, p. 113.  
 Aug.
- 8 *Cyclotomodon vagrans* from phosphate beds of Charleston, S. C.
- .417 Fourth Contribution to the History of the Existing Cetacea. *Proc. Acad. Nat. Sci. Phila.* Vol. XXVIII, 1876, pp. 129-139, Pls. III, IV, figs. 1-3.  
 Sept.
- 5
- .418 On a New Genus of Camelidae. *Proc. Acad. Nat. Sci. Phila.* Vol. XXVIII, 1876, pp. 144-147.  
 Sept.
- 5 *Protolabis*, type *P. heterodontus*.
- .419 Descriptions of some Vertebrate Remains from the Fort Union Beds of Montana. *Proc. Acad. Nat. Sci. Phila.* Vol. XXVIII, 1876, pp. 248-261. *Pal. Bull.* No. 22, pp. 1-14.  
 Nov.
- 13 *Ceratodus cruciferus*, *C. hieroglyphys*, new species, and *Myliodaphus bibartitus* new genus and species of fishes. Eighteen species described from Judith River formation, mostly dinosaur teeth; *Dysganus*, *Diclonius*, *Monoclonius*, *Paromychodon*, *Polythorax*, *Hedronchus*, new genera.
- 1877.420 Report upon the Extinct Vertebrata obtained in New Mexico by Parties of the Expedition of 1874. *Report, U. S. Geogr. Surveys West of the 100th Meridian* (Wheeler) Vol. IV, Part II, pp. 1-370, Pls. XXII-LXXXIII (4to).  
*Syllenus latifrons* from Mesozoic; *Clastis aganus* and *C. integra* from Eocene.
- .421 \*Comparative Anatomy. (Frazer) *Johnson's New Universal Cyclopædia*, Vol. I, pp. 1053-1077, figs. 1-36.
- .422 \*Osteology (Frazer) *Johnson's New Universal Cyclopædia*, Vol. III, pp. 1008-1016, figs. 1-25.
- .423 On some Extinct Reptiles and Batrachia from the Judith River and Fox Hills Beds of Montana. *Proc. Acad. Nat. Sci. Phila.* Vol. XXVIII, 1876, pp. 340-359. *Pal. Bull.* No. 23, pp. 1-20.  
 Jan.
- 10 Fifteen species described, mostly from Judith River Cretaceous; *Zapsalis*, *Uronautes*, *Champsosaurus*, *Scapherpeton*, *Hemitrypus* new genera.

- .424 Explorations in South America. *Proc. Acad. Nat. Sci. Phila.* Vol. XXVIII, 1876, p. 264.  
Jan. 23 Notice of Orton's expedition.
- .425 Cretaceous Vertebrates of the Upper Missouri. *Proc. Acad. Nat. Sci. Phila.* Vol. XXVIII, 1876, p. 266.  
Jan. 23 Note on correlation of Judith River formation.
- .426 The Suessonian Fauna in North America. *Amer. Nat.* Vol. XI, 1877, pp. 95-99.  
Feb. General characters of Wasatch fauna compared with Suessonian of Europe.
- .427 Reprint of Synopsis of Fishes of North Carolina with Addenda. March 1877, pp. 1-48.  
March 15 Date taken from Introduction.
- .428 A Continuation of Researches among the Batrachia of the Coal Measures of Ohio. *Proc. Amer. Philos. Soc.* Vol. XVI, 1877, pp. 573-578. *Pal. Bull.* No. 24, pp. 573-578.  
March 19 *Ichthyacanthus* gen. nov. and a new species of *Leptophractus* and *Tuditamus* described.
- .429 On a Dinosaurian from the Trias of Utah. *Proc. Amer. Philos. Soc.* Vol. XVI, 1877, pp. 579-584. *Pal. Bull.* No. 24, pp. 579-584.  
March 19 *Dystrophæus viemalæ*.
- .430 On a New Proboscidian. *Proc. Amer. Philos. Soc.* Vol. XVI, 1877, pp. 584-585. *Pal. Bull.* No. 24, pp. 584, 585.  
March 19 *Caenobasileus tremontigerus*. An artefact genus, based on fragments of Tertiary mastodon teeth incorrectly pieced together. See also 448.
- .431 On the Brain of *Coryphodon*. *Proc. Amer. Philos. Soc.* Vol. XVI, 1877, pp. 616-620, Pls. I, II. Abstract, "The Lowest Mammalian Brain," *Amer. Nat.* Vol. XI, 1877, pp. 312, 313.  
April 25 Description of the braincast of *C. elephantopus* from the New Mexican Wasatch. Separates April 25, 1877. Date from Miss Brown's MSS.
- .432 Discovery of *Laelaps* in Montana. *Amer. Nat.* Vol. XI, 1877, p. 311.  
May *L. incrassatus*, no description.
- .433 The Sea Serpents of the Cretaceous Period. *Amer. Nat.* Vol. XI, 1877, p. 311.  
May Notice of skelton of the *Elasmosaurus serpentinus* from Nebraska, and part of skeleton of *E. orientalis* from Upper Missouri.

- .434 The Dentition of the Herbivorous *Dinosauria* of the Lignitic  
 May Period. *Amer. Nat.* Vol. XI, 1877, pp. 311, 312.  
 Characters of teeth in Trachodontidae.
- .435 The Lowest Mammalian Brain. *Amer. Nat.* Vol. XI, 1877,  
 May p. 312.  
 Brief description of brain of *Coryphodon*.
- .436 Report on the Geology of the Region of the Judith River,  
 May Montana, and on Vertebrate Fossils obtained on or near  
 15 the Missouri River. *Bull. U. S. Geol. and Geogr. Survey of  
 the Territories*, Ser. III, No. 3, pp. 565-597, Pls. XXX-  
 XXXIV.
- .437 The Origin of the Will. *Penn Monthly*, Vol. VIII, 1877,  
 June pp. 435-455.
- .438 On the Brain of *Procamelus occidentalis*. *Proc. Amer. Philos.  
 June Soc.* Vol. XVII, 1877, pp. 49-52, Pl. I.  
 15 Description of the braincase of *P. "occidentalis"* from the  
 Upper Tertiary of New Mexico (Santa Fe beds). Sepa-  
 rates June 15, 1877. Date from Miss Brown's MSS.
- .439 On the Classification of the Recent and Fossil Fishes. *Amer.  
 Aug. Nat.* Vol. XI, 1877, p. 501.  
 Abstract of 491.
- .440 On a Carnivorous Dinosaurian from the Dakota Beds of Colo-  
 Aug. rado. *Bull. U. S. Geol. and Geogr. Survey of the Territories*,  
 15 Ser. III, No. 4, pp. 805, 806.
- .441 A Contribution to the Knowledge of the Ichthyological  
 Aug. Fauna of the Green River Shales. *Bull. U. S. Geol. and  
 15 Geogr. Survey of the Territories*, Ser. III, No. 4, pp. 807-819.  
 Abstract, "Verbal Communication on a New Locality of the  
 Green River Shales containing Fishes, Insects and Plants  
 in a good state of Preservation," *Pal. Bull.* No. 25, p. 1. Re-  
 printed abstract, "New Fossil Fishes from Wyoming," *Amer.  
 Nat.* Vol. XI, 1877, p. 570.  
 Sixteen fishes described including 5 new genera and 14  
 new species.
- .442 On the Genus *Erisichthe*. *Bull. U. S. Geol. and Geogr. Survey  
 Aug. of the Territories*, Ser. III, No. 4, pp. 821-823.  
 15 Discussion of the fragmentary remains on which 4 species  
 have been erected.
- .443 On a New Species of Adocidae from the Tertiary of Georgia.  
 Aug. *Proc. Amer. Philos. Soc.* Vol. XVII, 1877, pp. 82-84. *Pal.*  
 23 *Bull.* No. 25, pp. 2-4.  
*Amphiemys* gen. nov.

- .444 On a gigantic Saurian from the Dakota Epoch of Colorado.  
 Aug. *Pal. Bull.* No. 25, pp. 5-10.
- 23 First description of *Camarasaurus supremus* from the Morrison formation near Cañon City, Colorado. Based upon vertebrae. This is a little later than Marsh's first description of an Opisthocoelian (Sauropod) dinosaur from near Morrison, Colo. Marsh, however, used a pre-occupied name (*Titanosaurus*) so that Cope's name is the earliest available name for an American Opisthocoelian.
- .445 Fossil Remains of a Dinosaur. *Proc. Amer. Philos. Soc.*  
 Aug. Vol. XVI, 1877, pp. 386, 391.
- 31 Notice of exhibit and title of a paper.
- .446 Scratched Figures on Coal Shales. *Proc. Amer. Philos. Soc.*  
 Aug. Vol. XVI, 1877, p. 391.
- 31 Notice of *Dystrophaeus* (no name); and of Indian drawings from a mound near Davenport, Iowa.
- .447 Vertebral Column of *Elasmosaurus*. *Proc. Amer. Philos.*  
 Aug. *Soc.* Vol. XVI, 1877, pp. 393, 394. Abstract, "Sea Serpents of the Cretaceous Period," *Amer. Nat.* Vol. XI, 1877, p. 311.
- 31 Exhibition of *Elasmosaurus serpentinus* skeleton, name, no description.
- .448 New Species of Mastodon. *Proc. Amer. Philos. Soc.* Vol.  
 Aug. XVI, 1877, p. 394.
- 31 See also 430. Notice of *M. tremontinus*—no description [probably meant for "*Caenobasileus tremontigerus*"].
- .449 Cast of the Brain Cavity of *Coryphodon elephantopus*. *Proc.*  
 Aug. *Amer. Philos. Soc.* Vol. XVI, 1877, p. 395.
- 31
- .450 Rare Snakes from Florida. *Amer. Nat.* Vol. XI, 1877,  
 Sept. p. 565.
- Notice of an efficient collector.
- .451 The Largest Known Saurian. *Amer. Nat.* Vol. XI, 1877,  
 Oct. p. 629.
- .452 On some New or Little Known Reptiles and Fishes of the  
 Nov. Cretaceous No. 3, of Kansas. *Proc. Amer. Philos. Soc.*
- 21 Vol. XVII, 1877, pp. 176-181. *Pal. Bull.* No. 26, pp. 176-181.
- Descriptions of species of *Toxochelys* (Chelonia), *Ichthyodectes*, *Anogmus*, and *Oricardinus*, etc. (Pisces.)
- .453 Descriptions of Extinct Vertebrata from the Permian and  
 Nov. Triassic Formations of the United States. *Proc. Amer.*
- 21 *Philos. Soc.* Vol. XVII, 1877, pp. 182-193. *Pal. Bull.* No. 26, pp. 182-193 and p. 196. (In the Bulletin the last

paragraph of the original paper is appended at the end of the second article.) Abstract, "Remains of a Huge Saurian in Pennsylvania", *Amer. Nat.* Vol. XI, 1877, p. 629.

Teeth of dinosaurs, etc., from Phoenixville, Pa.; Permian vertebrates from Illinois; *Eryops* skull and skeleton from Permian ("Triassic") of Texas.

- .454 On Reptilian Remains from the Dakota Beds of Colorado.  
Nov. *Proc. Amer. Philos. Soc.* Vol. XVII, 1877, pp. 193-196.  
21 *Pal. Bull.* No. 26, pp. 193-196 (For final paragraph see explanation given for 453).  
*Caulodon* (teeth of *Camarasaurus*) and other vertebrates from Morrison formation, Cañon City, Col.; "*Clepsydrops limbatus* from the Permian of Texas.
- .455 On *Amphicalias*, a Genus of Saurians from the Dakota  
Dec. Epoch of Colorado. *Pal. Bull.* No. 27, pp. 2-5.  
10 Description of *A. altus* and "*A. latus*". Republished, *Proc. Amer. Philos. Soc.* Vol. XVII, pp. 242-246, and also as *Pal. Bull.* No. 28, same pagination. See 463.
- 1878.456 The Relation of Animal Motion to Animal Evolution. *Amer.*  
Jan. *Nat.* Vol. XII, 1878, pp. 40-48.  
The structure of animals is directly modified by their movements, and in adaptation to their habits and environment. [No clear distinction is made between the effects on the individual and upon the phylum.]
- .457 The Saurians of the Dakota Epoch. *Amer. Nat.* Vol. XII,  
Jan. 1878, pp. 56, 57.  
Summary of 455.
- .458 *Clepsydrops* in Texas. *Amer. Nat.* Vol. XII, 1878, p. 57.  
Jan.
- .459 The Affinities of the Dinosauria. *Amer. Nat.* Vol. XII, 1878,  
Jan. pp. 57, 58. (Cited by Hay.)  
Comments upon Owen's discussion in article describing *Omosaurus*.
- .460 Mount Lebanon Fishes in Dakota. *Amer. Nat.* Vol. XII,  
Jan. 1878, p. 57.  
Summary of article in *Bull. U. S. Geol. Survey*. Identity of genera in Mt. Lebanon, Dakota and Westphalia deposits.
- .461 Descriptions of New Vertebrata from the Upper Tertiary  
Jan. Formation of the West. *Proc. Amer. Philos. Soc.* Vol. XVII, 1877, pp. 219-231. *Pal. Bull.* No. 28, pp. 219-231. Abstracts, "New Artiodactyle of the Upper Tertiary."

*Amer. Nat.* Vol. XII, 1878, p. 58; and "A New Mastodon", *Ibid.*, p. 128.

First descriptions of Deep River fauna (Montana) and Republican River fauna (Kansas-Nebraska); new species from Pleistocene of Oregon and Washington. Two new species each of Cyprinoid genera, *Anchybopsis* and *Alburnops*. First abstract includes tenable descriptions of *Pitheciestes*, *Cyclopidius* and *Brachymeryx* new genera. Second abstract, tenable description of *Tetralophodon campistus*.

- .462 On some Saurians found in the Triassic of Pennsylvania by  
Jan. C. M. Wheatley. *Proc. Amer. Philos. Soc.* Vol. XVII, 1877,  
12 pp. 231, 232. *Pal. Bull.* No. 28, pp. 231, 232. Abstract, "Tri-  
assic Saurians from Pennsylvania", *Amer. Nat.* Vol. XII,  
1878, p. 58.

Dinosaur teeth from Phoenixville, Pa.

- .463 On the Vertebrata of the Dakota Epoch of Colorado. *Proc.*  
Jan. *Amer. Philos. Soc.* Vol. XVII, 1877, pp. 233-247, Pls. (1)-  
12 (9). *Pal. Bull.* No. 28, pp. 233-247 (Does not contain plates).

Revised descriptions of *Camarasaurus*, *Amphicoelias* etc., from Morrison formation, Cañon City, Col. See also 455.

- .464 On the Saurians recently discovered in the Dakota Beds of  
Jan. Colorado. *Amer. Nat.* Vol. XII, 1878, pp. 71-85, figs. 1-6,  
31 9-17.

Descriptions with figures of *Camarasaurus* and *Amphicoelias*, description of *Tichosteus*.

- .465 Pliocene Man. (Read before the Amer. Philos. Soc.) *Amer.*  
Jan. *Nat.* Vol. XII, 1878, pp. 125, 126. *Proc. Amer. Philos. Soc.*  
31 Vol. XVII, 1878, p. 292.

List of species of fossil mammals (Lower Pleistocene) found with obsidian arrow heads [Fossil Lake, Oregon]. While the *Proc. Amer. Philos. Soc.* is supposed to contain the original and the *Amer. Nat.* the reprint, the latter was the first to be published apparently.

- .466 Palaeontology of Georgia. *Amer. Nat.* Vol. XII, 1878,  
Jan. p. 128.

31 Note on position of *Erisichthe*. Cited by Hay.

- .467 The Snout of Fishes from the Kansas Chalk. *Amer. Nat.*  
Jan. Vol. XII, 1878, p. 129.

31 Abstract, eight lines.

- .468 A New Genus of Oreodontidæ. *Amer. Nat.* Vol. XII, 1878,  
Jan. p. 129.

31 Description of *Ticholeptus zygomaticus*, gen. et sp. nov. from Deep River beds of Montana.

- .469 Note on Fossils obtained by Mr. Russell S. Hill, including  
 Jan. Bones of *Protestega gigas*. *Amer. Nat.* Vol. XII, 1878, p. 137.  
 31 Cited by Hay.
- .470 Descriptions of Fishes from the Cretaceous and Tertiary  
 Feb. Deposits west of the Mississippi River. *Bull. U. S. Geol.*  
 5 *and Geogr. Survey of the Territories*, Ser. IV, No. 1, pp.  
 67-77.  
 Two new genera and eleven new species described.
- .471 Professor Owen on the *Pythonomorpha*. *Bull. U. S. Geol.*  
 Feb. *and Geogr. Survey of the Territories*, Ser. IV, No. 1, pp.  
 5 299-311.
- .472 A Texas Cliff Frog. *Amer. Nat.* Vol. XII, 1878, p. 186.  
 March *Lithodytes* n. sp. Note on habits.
- .473 A New Genus of *Dinosauria* from Colorado. *Amer. Nat.*  
 March Vol. XII, 1878, pp. 188, 189.  
 Description of *Hypsiroplus obscurus* gen. et sp. nov.
- .474 A New Deer from Indiana. *Amer. Nat.* Vol. XII, 1878,  
 March p. 189.  
 Description of *Cariacus dolichopsis* n. sp. from Pleistocene  
 of Indiana.
- .475 Synopsis of the Cold Blooded Vertebrata, procured by Prof.  
 March James Orton during his Exploration of Peru in 1876-1877.  
 9 *Proc. Amer. Philos. Soc.* Vol. XVII, 1877, pp. 33-49.  
 Nineteen fishes listed, eight being new.
- .476 Reptilian Bone Bed in Eastern Illinois. (On the Verte-  
 March brata of the Bone Bed in Eastern Illinois.) *Proc. Amer.*  
 9 *Philos. Soc.* Vol. XVII, 1877, pp. 2, 52-63.
- .477 On some New and Little Known Reptiles and Fishes from  
 March the Austroriparian Region. *Proc. Amer. Philos. Soc.* Vol.  
 9 XVII, 1877, pp. 63-68.  
 Nine batrachians, twenty-six reptiles and eleven fishes  
 from Georgia, South Carolina, Florida. Two new species of  
*Lepomis*, and *Xystroplites longimanus* Nov. Gen. et Sp. de-  
 scribed.
- .478 Tenth Contribution to the Herpetology of Tropical Ameri-  
 March ca. *Proc. Amer. Philos. Soc.* Vol. XVII, 1877, pp. 85-  
 9 98.
- .479 Contribution to the Fossil Flora of the Western Terri-  
 April tories. Part II, The Tertiary Flora, by Leo Lesquereux  
 (Review). *Amer. Nat.* Vol. XII, 1878, pp. 243-246.

Criticism of Lesquereux' conclusions upon the Cretaceous-Tertiary boundary formations in the Rocky Mountain region.

- .480 A New Genus of Cystignathidæ from Texas. *Amer. Nat.*  
 April Vol. XII, 1878, pp. 252, 253.  
*Syrrhopus marnockii*.
- .481 The Homology of the Chevron Bones. *Amer. Nat.* Vol.  
 May XII, 1878, p. 319.  
 Chevron bones are homologous with intercentra of dorsal and cervical vertebræ of Permian reptiles.
- .482 The Structure of *Coryphodon*. *Amer. Nat.* Vol. XII, 1878,  
 May pp. 324-326. Abstract, *Nature*, Vol. XVIII, 1878, p. 67.  
 Reply to Marsh's criticism in *Nature*, Vol. XVII, 1878, p. 340, of Cope's description of brain and foot structure of this genus.
- .483 Descriptions of New Extinct Vertebrata from the Upper  
 May Tertiary and Dakota Formations. *Bull. U. S. Geol. and*  
 3 *Geogr. Survey of the Territories*, Ser. IV, No. 2, pp. 379-396.
- .484 Descriptions of Extinct Batrachia and Reptilia from the  
 May Permian Formation of Texas. *Proc. Amer. Philos. Soc.*  
 8 Vol. XVII, 1878, pp. 505-530. *Pal. Bull.* No. 29, pp. 505-530.  
 Abstract, "A New Fauna," *Amer. Nat.* Vol. XII, 1878, pp. 327, 328.  
 Descriptions of *Diadectes*, *Bolosaurus*, *Pariotichus*, *Ectocynodon*, *Clepsydrops natalis* skeleton, *Dimetrodon*, *Epicordylus* (= *Eryops*), *Empedocles* (= *Diadectes*), *Theropleura*, *Parioxys*, "*Cricotus heteroclitus*", *Zatrachys*, *Trimerorhachis*, *Rachitomus* (= *Eryops*), etc. With the exception of *Eryops*, these are the first descriptions of the Texas Permian fauna.
- .485 A New Opisthocoelous Dinosaur. *Amer. Nat.* Vol. XII,  
 June 1878, p. 406. *Reprint, Ann. & Mag. Nat. Hist.* Ser. 5, Vol. II, 1878, p. 194.  
 Description of *Epanterias amplexus* gen. et sp. nov. from Morrison formation, Cañon City, Col.
- .486 Prof. Marsh on Permian Reptiles. *Amer. Nat.* Vol. XII,  
 June 1878, pp. 406-408.  
 Criticism of Marsh's paper in *Amer. Journ. Sci.* for May, 1878.
- .487 Fossorial Reptiles. *Amer. Nat.* Vol. XII, 1878, p. 408.  
 June Humeri of certain Permian reptiles appear to be of fossorial type.



- .488 Synopsis of the Fishes of the Peruvian Amazon, obtained  
 June by Prof. Orton during his Expeditions of 1873 and 1877.  
 10 *Proc. Amer. Philos. Soc.* Vol. XVII, 1878, pp. 673-701.  
 One hundred and twenty species listed from upper Amazon.  
 Three new genera and thirty new species established.
- .489 Proceedings of the Academy of Natural Sciences of Phila-  
 July delphia, September to December 1877. *Amer. Nat.* Vol.  
 XII, 1878, pp. 459-461.  
 Critical comment on President's Annual Report. Unsigned  
 Review. Cited by Frazer.
- .490 The Species of Rhinoceros of the Loup Fork Epoch. *Amer.*  
 July *Nat.* Vol. XII, 1878, pp. 488, 489.  
 Diagnosis of *Aphelops fossiger* and *malacorhinus* from Re-  
 publican River beds of Kansas.
- .491 On the Classification of the Extinct Fishes of the Lower  
 Aug. Types. *Proc. A. A. A. S.* XXVI Meeting, 1877, pp. 292-  
 300. (For abstract see 439.)  
 Critical discussion of bases of differentiation between the  
 lower forms of fishes.
- .492 The Report of the Committee of the American Association  
 Aug. of 1876 on Biological Nomenclature. *Amer. Nat.* Vol. XII,  
 1878, pp. 517-525.  
 Results of a questionnaire.
- .493 Review—The Relation of the Mosaic Cosmography to Sci-  
 Aug. ence, by C. B. Warring, Ph. D. *Amer. Nat.* Vol. XII, 1878,  
 pp. 547-549. Unsigned. Cited by Frazer.
- .494 Note on the Prong-Horned Antelope. *Amer. Nat.* Vol. XII,  
 Aug. 1878, p. 557.  
 Shedding of the horns is not periodical or even frequent.
- .495 A New Species of *Amphicalias*. *Amer. Nat.* Vol. XII, 1878,  
 Aug. pp. 653, 654, 1 fig.  
 Description of *A. fragillimus* from Morrison beds near  
 Cañon City, Col. [part of a gigantic vertebrate].
- .496 A New *Diadectes*. *Amer. Nat.* Vol. XII, 1878, p. 565.  
 Aug. Description of *D. molaris* from Permian of Texas. Un-  
 signed. Cited by Hay and Frazer.
- .497 Des rapports entre le mouvement et l'évolution chez les  
 Aug. animaux. *Revue internat. des Sciences*, Tre Anné, No. 31,  
 1 pp. 138-141. See 456.

- .498 On the Saurians of the Dakota Cretaceous Rocks of Colorado. *Nature*, Vol. XIII, Aug. 29, p. 476. *Proc. British A. A. S.* 1878, p. 545.  
 Aug. 29 Abstract of paper read before British A. A. S. 1878.
- .499 On the Remains of a Permian Fauna in North America. *Nature*, Vol. XIII, Aug. 29, 1878, p. 482.  
 Aug. 29 Abstract of paper read before the British A. A. S. Title only in *Proc. British A. A. S.* 1878, p. 571.
- .500 The Vertebræ of *Rachitonus*. *Amer. Nat.* Vol. XII, 1878, p. 633.  
 Sept. Construction of the vertebræ. *Eryops* is probably similar.
- .501 A Fossil Walrus discovered at Portland, Maine. *Amer. Nat.* Vol. XII, 1878, p. 633.  
 Sept. Notice of discovery. Skeleton in Museum of Portland Nat. Hist. Soc. Unsigned. Cited by Hay.
- .502 The Herpetology of New Guinea. *Amer. Nat.* Vol. XII, 1878, p. 751.  
 Nov. Review of an article by H. E. Sauvage in the Bulletin, Société philomatique, Paris.
- .503 The Fauna of the Lowest Tertiary of France. *Amer. Nat.* Vol. XII, 1878, pp. 761, 762.  
 Nov. Notice of the palæontological discoveries of Dr. Lemoine in the Lowest Tertiary of France.
- .504 The Excursions of the Geological Society of France for 1878. *Amer. Nat.* Vol. XII, 1878, pp. 771-776.  
 Dec.
- .505 The Principal Characters of American Cretaceous Dinosaurs. *Amer. Nat.* Vol. XII, 1878, pp. 811, 812.  
 Dec. Critical review of Marsh's paper in *Amer. Journ. Sci.* with this title. Unsigned. Cited by Frazer.
- .506 The Theromorphous Reptilia. *Amer. Nat.* Vol. XII, 1878, pp. 829, 830.  
 Dec. Abstract with diagnoses of orders and suborders; *Dimetrodon cruciger* sp. nov. from Permian of Texas. Abstract of paper read before the National Academy of Sciences, Nov. 7, 1878.
- .507 On some of the Characters of the Miocene Fauna of Oregon. *Proc. Amer. Philos. Soc.* Vol. XVIII, 1878, pp. 63-78.  
 Dec. 26 *Pal. Bull.* No. 30, pp. 1-16. Abstract, "Miocene Vertebrata of Oregon," *Amer. Nat.* Vol. XII, 1878, p. 833.  
 Based upon collections of Sternberg, Wortman and Day in

- the John Day basin. Chiefly Rodents, Carnivores and Horses from the John Day formation.
- 1879.508 Palæontological Report of the Princeton Scientific Expedition  
Jan. of 1877. *Amer. Nat.* Vol. XIII, 1879, pp. 32, 33.
- 4 Unsigned Review of "Contributions from the Museum of Geology and Archæology of Princeton College. No. 1-, Palæontological Report etc., by Henry F. Osborn, W. B. Scott and Francis Spier, Jr." Cited by Hay.
- .509 Letter from O. C. Marsh, etc. transmitting the Report on  
Jan. the Scientific Surveys of the Territories. *Amer. Nat.* Vol. XIII, 1879, pp. 35-37.
- 4 Review of, "Letter from O. C. Marsh, vice-president and acting president of the National Academy of Sciences, transmitting, in obedience to law, the Report on the Scientific Surveys of the Territories made by the National Academy of Sciences, Senate Mis. Doc. No. 19." Objections to plan for discontinuance of existing U. S. geological surveys and replacement by a new survey.
- .510 Extinct Mammalia of Oregon. *Amer. Nat.* Vol. XIII, 1879,  
Feb. p. 131.
- 4 Tenable description of *Enhydrocyon* gen. nov. For full paper see 516.
- .511 The Necks of Sauropterygia. *Amer. Nat.* Vol. XIII, 1879,  
Feb. p. 132.
- 4 Progressive shortening of the neck during the Cretaceous.
- .512 The Scales of *Liodon*. *Amer. Nat.* Vol. XIII, 1879, p. 132.  
Feb. Six lines.
- 4 Unsigned. A brief note calling attention to observations of Professor Snow and to his paper in Review of Science and Industry—Hay.
- .513 The Origin of the Specialized Teeth of the Carnivora.  
Feb. *Amer. Nat.* Vol. XIII, 1879, pp. 171-173. *Ann. & Mag. Nat. Hist.* Ser. 5, Vol. III, 1879, pp. 391, 392.
- 27 Explanation of the mechanical causes operating to evolve the carnassial teeth.
- .514 *Merycopater* and *Hoplophoneus*. *Amer. Nat.* Vol. XIII,  
Feb. 1879, p. 197.
- 27 Note on John Day fossil mammalia. *Merycopater* gen. nov. (= *Agriochærus*); *Machærodus brachyops* transferred to *Hoplophoneus*.
- .515 The Relations of the Horizons of Extinct Vertebrata of  
Feb. Europe and North America. *Bull. U. S. Geol. and Geogr. Survey of the Territories*, Ser. V, No. 1, pp. 33-54.
- 28

- .516 Observations on the Faunæ of the Miocene Tertiaries of  
Feb. Oregon. *Bull. U. S. Geol. and Geogr. Survey of the*  
28 *Territories*. Vol. V, No. 1, pp. 55-69.  
For abstract see 510.
- .517 A Review of the Modern Doctrine of Evolution. (Read  
March before the California Academy of Sciences, October 27,  
13 1879.) \**Scientific Press* Supplement, November, 1879, pp.  
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- .522 The Amyzon Tertiary Beds. *Amer. Nat.* Vol. XIII, 1879,  
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- .523 Gaudry on Permian Vertebrata. *Amer. Nat.* Vol. XIII,  
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- .525 American Aceratheria. *Amer. Nat.* Vol. XIII, 1879, pp.  
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- .568 The Geological Record. *Amer. Nat.* Vol. XIV, 1880, pp.  
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*malacorhinus* referred to this genus. Both from Republican  
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 July Vol. XIV, 1880, pp. 610, 611.  
 22 *Triplopus* ancestral to *Aphelops* through *Cænopus* gen. nov.  
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 and *Ceratorhinus* into *Rhinoceros* proper. *Aceratherium* side  
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21 Notice of Wortman's collections of fossil mammals for Prof. Cope. Descriptions of *Protopsalis* and *Lambdotherium* new genera, and ten new species.
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- .580 The Northern Wasatch Fauna. *Amer. Nat.* Vol. XIV, Nov. 1880, pp. 908, 909.  
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- .585 The Vertebrata of the Eocene of the Wind River Basin.  
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 Jan. XV, 1881, pp. 124-126.  
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- .588 Catalogue of the Vertebrata of the Permian Formation of  
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- .589 On some New Batrachia and Reptilia from the Permian  
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- .591 On the *Nimravidæ* and the *Canidæ* of the Miocene Period.  
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 11 VI, No. 1, pp. 165-181. See 581.
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- .593 [Laws of Nomenclature.] *Amer. Nat.* Vol. XV, 1881, pp.  
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- .594 The Japanese Lap Dog. *Amer. Nat.* Vol. XV, 1881, pp.  
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- .595 Extinct Palæozoic Fishes from Canada. *Amer. Nat.* Vol.  
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24 Notice of article by Whiteaves on discoveries in Devonian  
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24 and of *Charadius sheppardianus* from Amyzon beds of Colo-  
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- .597 Geological News. *Amer. Nat.* Vol. XV, 1881, pp. 254, 340,  
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24 Unsigned notes. Cited by Hay. Brief notes of various  
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*phus*.
- .598 On the Origin of the Foot Structures of the Ungulates.  
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25 Explanation of the origin of specialized foot structures of  
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- .599 Mammalia of the Lower Eocene Beds. *Amer. Nat.* Vol.  
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*minis*, new genera and species.
- .600 Filhol on *Proælorus*. *Amer. Nat.* Vol. XV, 1881, pp. 339,  
March 340.  
25 Unsigned. Cited by Frazer. Notice of Filhol's memoir on  
*P. lemanensis* in *Bull. soc. sci. phys. et nat.*
- .601 The Classification of the Perissodactyla. *Amer. Nat.* Vol.  
March XV, 1881, p. 340.  
25 Tabular key, taken from *Rept. U. S. G. S. Terr. (Tertiary*  
*Vertebrata.)*
- .602 The Systematic Arrangement of the Order *Perissodactyla*.  
May *Proc. Amer. Philos. Soc.* Vol. XIX, 1881, pp. 377-401,  
14 figs. 1, 2.  
Key to families, geological distribution of genera, charac-  
ters of each family and key to included genera; descriptions  
of *Triplopus cubitalis* and *T. amarorum*, pp. 377-386, printed  
May 14; pp. 387-401, May 16.

- .603 Note on the Structure of the Posterior Foot of *Toxodon*.  
 May *Proc. Amer. Philos. Soc.* Vol. XIX, 1881, pp. 402, 403.  
 16 *Ann. & Mag. Nat. Hist.*, Ser. 5, Vol. VIII, 1881, pp. 389, 390.  
 Based upon specimens in the Ameghino collection purchased by Professor Cope (Cope Pampean Collection, Amer. Mus. Nat. Hist.). The structure forbids reference to Perisodactyla or Artiodactyla and suggests Proboscidean affinities.
- .604 Miocene Dogs. *Amer. Nat.* Vol. XV, 1881, p. 497.  
 May Diagnosis of *Oligobonis* new genus, and revision of diagnosis of *Hyaenocyon* Cope. Corrections and additions to the paper in Bull. Geol. and Geogr. Surveys of the Territories Vol. VI, No. 1, p. 177.  
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- .605 On the Effects of Impacts and Strains on the Feet of Mammalia. *Amer. Nat.* Vol. XV, 1881, pp. 542-548, figs. 1-11.  
 June Further discussion of the evolution of the foot construction in various ungulates. Read before the National Academy of Sciences, April, 1881.  
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- .606 [Description and Iconography in Biology.] *Amer. Nat.* Vol. XV, 1881, pp. 548, 549.  
 June Analytical descriptions cannot be superseded by pictures. Editorial.  
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- .607 Primary Object of an Academy of Science. *Amer. Nat.* Vol. XV, 1881, p. 549.  
 June Research. Teaching is a collateral activity. Unsigned editorial. Cited by Frazer.  
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- .608 The *Rodentia* of the American Miocene. *Amer. Nat.* Vol. XV, 1881, pp. 586, 587.  
 June List of 37 species from White River and John Day formations.  
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- .609 A New *Clidastes* from New Jersey. *Amer. Nat.* Vol. XV, 1881, pp. 587, 588.  
 June Description *C. condon* from a partial skeleton (in Rutgers College).  
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- .610 [Insanity and Responsibility.] *Amer. Nat.* Vol. XV, 1881, pp. 641-643.  
 July Unsigned editorial. Cited by Frazer.  
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- .611 The Temporary Dentition of a New Creodont. *Amer. Nat.* Vol. XV, 1881, pp. 667-669.  
 July *Triisodon quivirensis* gen. et sp. nov. based upon a lower jaw from the Puerco formation of New Mexico; and *Dclatherium absaroka* (afterwards type of *Didelphodus*) from Wasatch formation of Bighorn basin, Wyo.  
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- .612 A Laramie Saurian in the Eocene. *Amer. Nat.* Vol. XV,  
July 1881, pp. 669, 679.  
27 *Champosaurus*, from Puerco formation of New Mexico.
- .613 Review of the Rodentia of the Miocene Period of North  
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- .614 On the Canidæ of the Loup Fork Epoch. *Bull. U. S. Geol.*  
Sept. *and Geogr. Survey of the Territories* Vol. VI, No. 2, pp.  
19 387-390.
- .615 [Criticism of Mr. Barn's Metaphysical Definitions.] *Amer.*  
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- .616 Mammalia of the Lowest Eocene. *Amer. Nat.* Vol. XV,  
Sept. 1881, pp. 829-831.  
23 *Conoryctes*, *Catathlæus* and *Mioclanus*, new genera, from  
the Puerco formation. Abstract of 618.
- .617 Geology of the Lake Valley Mining District. *Amer. Nat.*  
Sept. Vol. XV, 1881, pp. 831, 832.  
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- .618 On some Mammalia of the Lowest Eocene Beds of New  
Sept. Mexico. *Proc. Amer. Philos. Soc.* Vol. XIX, 1881, pp.  
30 484-495. *Pal. Bull.* No. 33, pp. 484-495.  
Descriptions of *Periptychus*, *Conoryctes*, *Triisodon*, *Delta-*  
*therium*, *Catathlæus*, *Anisonchus*, *Mioclanus*—13 species of  
these and other genera. Cope does not at this time appear to  
have been certain whether this fauna was from his Puerco  
formation or not. "Their horizon is below the Wasatch and  
they represent a different fauna from that of those beds."  
See 616 for first notice.
- .619 The Fauna of the Nickajack Cave. (With A. S. Packard,  
Oct. Jr.) *Amer. Nat.* Vol. XV, 1881, pp. 877-882.  
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- .620 [Rules governing Nomenclature.] *Amer. Nat.* Vol. XV,  
Oct. 1881, pp. 883, 884.  
28 Unsigned editorial. Cited by Frazer. Rules of Internat.  
Geol. Congress approved, except as to requirement of figure  
for valid description of new forms. A description is neces-  
sary; but that it should be "clear and adequate" is to demand  
too much.
- .621 A Memoir on the *Loxolophodon* and *Uintatherium*, by Henry  
Oct. F. Osborn, Sc. D. *Amer. Nat.* Vol. XV, 1881, p. 888, 2 figs.  
28 Unsigned review of "A Memoir upon *Loxolophodon* and  
*Uintatherium*," etc. Cited by Frazer.

- .622 Eocene Plagiaulacidae. *Amer. Nat.* Vol. XV, 1881, pp. 921,  
 Oct. 922.  
 28 *Ptilodus mediaevus* gen. et sp. nov. described from a tooth  
 from the Puerco formation of New Mexico.
- .623 *Belodon* in New Mexico. *Amer. Nat.* Vol. XV, 1881, pp.  
 Oct. 922, 923.  
 28 *Belodon buceros* and *ocolopax* described, the former from  
 a skull.
- .624 [Biology as a Profession.] *Amer. Nat.* Vol. XV, 1881,  
 Dec. pp. 987-990.  
 Unsigned editorial. Cited by Frazer.
- .625 A New Type of *Perissodactyla*. *Amer. Nat.* Vol. XV, 1881,  
 Dec. pp. 1017, 1018.  
 3 Preliminary description of skeleton of *Phenacodus pri-*  
*maevus* from Bighorn basin (Wasatch) of Wyoming. *Condylar-*  
*larthra* proposed as a suborder of *Perissodactyla*.
- .626 New Genus of *Perissodactyla diplarthra*. *Amer. Nat.* Vol.  
 Dec. XV, 1881, p. 1018.  
 3 *Systemodon* based upon specimens from Bighorn Wasatch  
 (incorrectly) referred to *Hyrocotherium tapirinum*.
- .627 Notes on *Creodonta*. *Amer. Nat.* Vol. XV, 1881, pp. 1018-  
 Dec. 1020.  
 3 *Pachyana* = *Mesonyx*; *Dissacus*, a new genus, based upon  
*M. navajovius* of Puerco formation; *Lipodectes* gen. nov.  
 from same horizon, with two species, *penitrans* and *schidens*.
- .628 The Permian Formation of New Mexico. *Amer. Nat.* Vol.  
 Dec. XV, 1881, pp. 1020, 1021.  
 3 *Eryops reticulatus* and *Zatrachys apicalis* described; other  
 Permian genera cited as occurring.
- .629 (Legal Insanity.) *Amer. Nat.* Vol. XVI, 1882, pp. 33, 34.  
 Dec. Editorial.  
 30
- .630 The Oldest Artiodactyle. *Amer. Nat.* Vol. XVI, 1882, p. 71.  
 Dec. Description of type (jaws, foot, etc.) of *Mioclaenus* (now  
 30 *Diacodexis*) *brachystomus* from Wasatch of Bighorn basin.
- .631 The Characters of the *Tæniodonta*. *Amer. Nat.* Vol. XVI,  
 Dec. 1882, p. 73.  
 30 Characters of *Calamodon*, *Tillotherium* and *Esthonyx* com-  
 pared.
- .632 New Forms of *Coryphodontida*. *Amer. Nat.* Vol. XVI,  
 Dec. 1882, p. 72.  
 30 Key to genera; two new, *Manteodon* and *Ectacodon*.

- .633 An Anthropomorphous Lemur. *Amer. Nat.* Vol. XVI, 1882,  
Dec. pp. 73, 74.  
30 Notice of cranium of "*Anaptomorphus*" (now *Tetonius*)  
*homunculus* from Bighorn Wasatch. "The genus is nearer  
the hypothetical lemuroid ancestor of man than any yet dis-  
covered."
- .634 Recent Extinction of the Mastodon. *Amer. Nat.* Vol. XVI,  
Dec. 1882, pp. 74, 75.  
30 Unsigned. Cited by Hay. Preservation of bones, fat and  
stomach-contents in two Illinois skeletons.
- 1882.635 [Science and Art.] *Amer. Nat.* Vol. XVI, 1882, pp. 123, 124.  
Jan. Unsigned editorial. Cited by Frazer.  
25
- .636 A New Genus of Tillodonta. *Amer. Nat.* Vol. XVI, 1882,  
Jan. pp. 156, 157.  
25 Description of *Psittacotherium multifragum* gen. sp. nov.  
from Puerco formation of New Mexico.
- .637 A great Deposit of Mud and Lava. *Amer. Nat.* Vol. XVI,  
Jan. 1882, pp. 157, 158.  
25 The Puerco region of N. W. New Mexico.
- .638 Invertebrate Fossils from the Lake Valley District, New  
Jan. Mexico. *Amer. Nat.* Vol. XVI, 1882, pp. 158, 159.  
25 List of Lower Carboniferous fossils, identifications by S.  
A. Miller.
- .639 Contributions to the History of the Vertebrata of the Lower  
Feb. Eocene of Wyoming and New Mexico, made during 1881.  
20 *Proc. Amer. Philos. Soc.* Vol. XX, 1881, pp. 139-197; Map  
of the Bighorn Basin. *Pal. Bull.* No. 34, pp. 139-197. (Has  
no map.) Abstract, *Amer. Journ. Sci.*, Ser. 3, Vol. XXIII,  
1882, pp. 324-325.  
Descriptions of fossil vertebrate collections made by J. L.  
Wortman for Cope in the Bighorn Basin during the sum-  
mer of 1881. The descriptions are somewhat amplified and  
illustrations provided in "Tertiary Vertebrata," 1884. In-  
cludes a classification of the Chelonian families and genera,  
first description of the Eocene lemuroid "*Anaptomorphus*  
*homunculus*" skull; classification of Creodonta and descrip-  
tion of various new forms; revision of the Coryphodontidae  
and description of new species; brief synopsis of characters  
and species of *Phenacodus*; new species of *Hyracotherium*,  
*Systemodon*, etc.; *Mioclaenus brachystomus* sp. nov. an un-  
questionable artiodactyl. Fauna is typical Wasatch; distinc-



- tions from Wind River fauna. Descriptions of a number of new mammals from the "Catathlaeus beds" of New Mexico (Puerco).
- .640 The Tertiary Formations of the Central Region of the  
Feb. United States. *Amer. Nat.* Vol. XVI, 1882, pp. 177-195,  
24 figs. 1-8.  
Description of the successive Tertiary "lakes," their location and extent, character of the formations and prominent features of the faunae.
- .641 [The Equivalents of Consciousness.] *Amer. Nat.* Vol. XVI,  
Feb. 1882, pp. 224-226.  
24 Review of essay by E. DuBois Raymond, *The Seven World Problems*, translated in *Pop. Sci. Mo.* Vol. XX, pp. 433-447.
- .642 Marsh on the Classification of the Dinosauria. *Amer. Nat.*  
Feb. Vol. XVI, 1882, pp. 253-255.  
24 Critical Review of Marsh's article in *Amer. Journ. Sci.* (3) Vol. XXIII, pp. 81-86.
- .643 The Dinosaurs of Bernissart. *Amer. Nat.* Vol. XVI, 1882,  
Feb. pp. 255, 256.  
24 Review of articles by G. A. Boulenger and P. J. Van Beneden. *Bull. Acad. R. de Belge*, 1881, Ser. 3, T. I., pp. 600-608. Unsigned review, evidently Cope's. (w. D. M.)
- .644 Hulke on *Polacanthus foxi*. *Amer. Nat.* Vol. XVI, 1882,  
Feb. p. 256.  
24 Notice of description of this English dinosaur by J. M. Hulke in *Trans. R. Soc. London* Vol. 72, Pt. III, 1881, pp. 653-662, Pls. 70-76. Unsigned. Evidently by Cope. (w. D. M.)
- .645 Russian Sauropterygia. *Amer. Nat.* Vol. XVI, 1882, p. 256.  
Feb. Notice of memoir on Ichthyosaurus by Kiprijanoff in *Mem. Acad. Imper. Sci. St. Petersbourg*, Ser. 7, T. XXVIII, No. 8.  
24
- .646 [Effort and Use in Evolution.] *Amer. Nat.* Vol. XVI, 1882,  
March pp. 311-313. Editorial.  
22 Further discussion of the views of E. DuBois Raymond.
- .647 New Characters of the *Perissodactyla Condylarthra*. *Amer.*  
March *Nat.* Vol. XVI, 1882, p. 334.  
22 Creodont characters of humerus in *Phenacodus*. *Meniscotherium* referred to this suborder; key to families.
- .648 *Mesonyx* and *Oxyana*. *Amer. Nat.* Vol. XVI, 1882, p. 334.  
March Characters of limb bones in *Mesonyx* (now *Pachyaena*)  
22 *ossifragus*; of hind foot in *Oxyana*. Based on Wortman's Bighorn Wasatch collections.

- .649 The Rachitomous Stegocephali. *Amer. Nat.* Vol. XVI, 1882,  
 March pp. 334, 335.  
 22 Ganocephala not available. Rhachitomi suborder, including *Eryops*, *Actinodon*, *Trimerorhachis*, *Zatrachys*, etc., in two families.
- .650 A Second Genus of Eocene Plagiaulacidae. *Amer. Nat.* Vol.  
 April XVI, 1882, pp. 416, 417.  
 24 *Catopsalis foliatus* gen. et sp. nov. described from Puerco of New Mexico.
- .651 Two New Genera of the Puerco Eocene. *Amer. Nat.* Vol.  
 April XVI, 1882, pp. 417, 418.  
 24 Description of *Haploconus lineatus* and *Pantolambda bathmodon* new genera and species.
- .652 On Archæsthetism. *Amer. Nat.* Vol. XVI, 1882, pp. 454-469.  
 May Discussion of the origin of adaptive changes in phyla;  
 20 the nature of consciousness and its relations thereto, as a fundamental cause of evolution.
- .653 [Sexual Selection in Man.] *Amer. Nat.* Vol. XVI, 1882,  
 May pp. 490-492.  
 20 Editorial.
- .654 The Ancestry and Habits of *Thylacoleo*. *Amer. Nat.* Vol.  
 May XVI, 1882, pp. 520-522.  
 20 *Thylacoles*, a descendant of the *Plagiaulacidae*. *Hypriprymus* parallel not nearly related. Probably not herbivorous, perhaps egg-eating or even carnivorous. •
- .655 Notes on Eocene Mammalia. *Amer. Nat.* Vol. XVI, 1882,  
 May p. 522.  
 20 *Didelphodus* and *Ectocion* new genera, Wasatch Eocene Bighorn basin.
- .656 On the *Taxæopoda*, a New Order of *Mammalia*. *Amer.*  
 May *Nat.* Vol. XVI, 1882, pp. 522, 523.  
 20 Carpus of *Phenacodus* excludes it from Perissodactyla. The new order includes Condylarthra and Proboscidea. Key to Ungulate orders.
- .657 [Note on *Achanodon insolenus*.] *Amer. Nat.* Vol. XVI, 1882,  
 May p. 534.  
 20 Notice of discovery of skull by Princeton Expedition.
- .658 On the *Condylarthra*. *Proc. Acad. Nat. Sci. Phila.* Vol.  
 June XXXIV, 1882, pp. 95-97. Reprint, *Ann. & Mag. Nat. Hist.*,  
 6 Ser. 5, Vol. X, 1882, pp. 76-79.

- .659 A New Genus of Tæniodonta. *Amer. Nat.* Vol. XVI, 1882,  
 June pp. 604, 605.  
 22 *Tæniolabis sulcatus* gen. et sp. nov., based upon an incisor  
 tooth from the Puerco of New Mexico. Unsigned. Cited by  
 Hay and Frazer.
- .660 [The Philadelphia Academy of Natural Sciences.] *Amer.*  
 July *Nat.* Vol. XVI, 1882, pp. 663, 664.  
 28 Unsigned editorial. Cited by Frazer.
- .661 New Marsupials from the Puerco Eocene. *Amer. Nat.*  
 July Vol. XVI, 1882, pp. 684-686.  
 28 Descriptions of *Polymastodon taöensis* and *Catopsalis*  
*pollux* new genera and species. (These subsequently proved  
 to be founded upon the upper and lower dentition of the  
 same individual. Both are probably identical with *Tæniolabis*  
*sulcatus*.) New species of *Ptilodus* and *Haploconus* also de-  
 scribed; all from Puerco formation of New Mexico.
- .662 [Projects for Commemorating Men of Science.] *Amer. Nat.*  
 Sept. Vol. XVI, 1882, pp. 803, 804.  
 28 Unsigned editorial. Cited by Frazer.
- .663 Mammalia in the Laramie Formation. *Amer. Nat.* Vol.  
 Sept. XVI, 1882, pp. 830, 831.  
 28 Description of *Meniscæssus conquistus* gen. et sp. nov.  
 (from the Lance formation).
- .664 A New Form of Tæniodonta. *Amer. Nat.* Vol. XVI, 1882,  
 Sept. pp. 831, 832.  
 28 *Hemiganus vultuosus* (= *Psittacotherium*) from Puerco of  
 New Mexico.
- .665 The *Periptychida*. *Amer. Nat.* Vol. XVI, 1882, pp. 832, 833.  
 Sept. Structure of brain and foot, etc., in *Periptychus*; descrip-  
 28 tion of *Hemithlæus kowalevskianus* gen. et sp. nov., etc.
- .666 Some New Forms from the Puerco Eocene. *Amer. Nat.*  
 Sept. Vol. XVI, 1882, pp. 833, 834.  
 28 New species of *Miocænus*, *Protogonia* and *Dissacus*.
- .667 [Remarks on Guiteau's Brain.] *Amer. Nat.* Vol. XVI, 1882,  
 Oct. pp. 895, 896.  
 28 Unsigned editorial. Cited by Frazer.
- .668 [Note on the Bite of a Gila Monster.] *Amer. Nat.* Vol.  
 Oct. XVI, 1882, pp. 908, 909.  
 28
- .669 The Recent Discoveries of Fossil Footprints in Carson,  
 Oct. Nevada. *Amer. Nat.* Vol. XVI, 1882, pp. 921-923.  
 28 Unsigned. Cited by Hay. Notice of paper by Le Conte  
 read before the California Academy of Sciences.

- .670 Geological News. *Amer. Nat.* Vol. XVI, 1882, pp. 925, 926.  
 Oct. Brief notices of papers by Scudder, *Amer. Journ. Sci.* (3)  
 28 Vol. XXIV, pp. 161-170; McGee and Call, *Ibid*, pp. 202-223;  
 Scott and Osborn, *Ibid*, pp. 223-225. Unsigned. Cited by Hay.
- .671 The Classification of the Ungulate Mammalia. *Proc. Amer.*  
 Nov. *Philos. Soc.* Vol. XX, 1882, pp. 438-447. *Pal. Bull.* No. 35,  
 11 pp. 438-447. Abstract, *Science* Vol. I, 1883, p. 182.  
 Construction of carpus and tarsus is fundamental to the  
 ordinal classification. Relations of carpals and tarsals in dif-  
 ferent groups of ungulates; key to orders; phylogeny.
- .672 Third Contribution to the History of the Vertebrata of the  
 Nov. Permian Formation of Texas. *Proc. Amer. Philos. Soc.*  
 11 Vol. XX, 1882, pp. 447-461. *Pal. Bull.* No. 35, pp. 447-461.  
 Abstract, "Permian Vertebrata," *Amer. Nat.* Vol. XVI,  
 1882, p. 925.  
 Descriptions of *Edaphosaurus*, *Ectocynodon*, *Diplocaulus*,  
*Acheloma*, *Anisodexis*, the first and last two new genera.
- .673 Synopsis of the Vertebrata of the Puerco Eocene Epoch.  
 Nov. *Proc. Amer. Philos. Soc.* Vol. XX, 1882, pp. 461-471. *Pal.*  
 11 *Bull.* No. 35, pp. 461-471.  
 List of vertebrata, chiefly mammals; descriptions of a  
 number of new species; relations of the fauna.
- .674 On the Systematic Relations of the *Carnivora* Fissipedia.  
 Nov. *Proc. Amer. Philos. Soc.* Vol. XX, 1882, pp. 471-475. *Pal.*  
 11 *Bull.* No. 35, pp. 471-475. Reprint, *Ann. & Mag. Nat. Hist.*,  
 Ser. 5 Vol. XII, 1883, pp. 112-116.  
 Classification, based primarily upon the turbinal bones, then  
 upon teeth, alisphenoid, etc.; list of genera of each family.  
*Plethaelurus* gen. nov. for *Felis planiceps*.
- .675 The Reptiles of the American Eocene. *Amer. Nat.* Vol.  
 Dec. XVI, 1882, pp. 979-993, figs. 11-13.  
 2 Review of Eocene reptilian fauna; figures of *Palacophis*  
 vertebræ; skulls of 3 species of Crocodiles, several turtles.
- .676 [Women in Universities.] *Amer. Nat.* Vol. XVI, 1882, pp.  
 Dec. 994, 995.  
 2 Unsigned editorial. Cited by Frazer.
- .677 Two New Genera of Mammalia from the Wasatch Eocene.  
 Dec. *Amer. Nat.* Vol. XVI, 1882, p. 1029.  
 2 *Diacodexis* and *Heptodon*, new genera, from the Bighorn  
 basin.

- .678 Restoration of *Loxolophodon cornutus* Cope, one-twentieth  
 Dec. natural size. From the Bridger Eocene of Wyoming. *Amer.*  
 2 *Nat.* Vol. XVI, 1882, Pl. XVII (no text).  
 Reduced from drawing afterwards published in "Tertiary  
 Vertebrata."
- 1883.679 On the contents of a Bone Cave in the Island of Anguilla  
 (West Indies). *Smithsonian Contrib. to Knowledge* Vol.  
 XXV, Art. 3, pp. 1-34, Pls. I-V. Separates 1883.  
 Extended description and illustrations of *Amblyrhiza*, etc.
- .680 The Classification of the Ungulata. *Proc. A. A. A. S.* XXXI  
 Meeting, 1882, pp. 477-479.
- .681 The Fauna of the Puerco Eocene. *Proc. A. A. A. S.* XXXI  
 Meeting, 1882, pp. 479, 480.
- .682 The Nevada Biped Tracks. *Amer. Nat.* Vol. XVII, 1883,  
 Jan. pp. 69, 70, three figures.  
 5 Remarks with figures from Harkness' paper before Calif.  
 Acad. Sci. Supposed to be a reprint of 689, but in reality ap-  
 pearing first. The cuts are not in the *Proc. Acad. Nat. Sci.*  
*Phila.*
- .683 On *Uintatherium* and *Bathmodon*. *Amer. Nat.* Vol. XVII,  
 Jan. 1883, p. 68.  
 5 Distinctions in incisors between *Uintatherium* and *Bathy-*  
*opsis*; in astragalus between *Coryphodon* and *Bathmodon*.  
 Intended as an abstract of 690.
- .684 The Extinct Rodentia of North America. *Amer. Nat.* Vol.  
 Jan. XVII, 1883, pp. 43-57; 165-174; 370-381; figs. 1-30.  
 5 Key to classification, geological distribution, review of  
 genera and species with figures of many specimens from  
 Wasatch and Bridger, White River and John Day; after-  
 wards published in extenso in "Tertiary Vertebrata." The  
 groups of pages appeared successively on January 5th and  
 31st, and March 15.
- .685 [The National Academy of Sciences.] *Amer. Nat.* Vol.  
 Jan. XVII, 1883, pp. 59, 60.  
 5 Unsigned editorial. Cited by Frazer.
- .686 Kowalevsky on *Elasmotherium*. *Amer. Nat.* Vol. XVII,  
 Jan. 1883, p. 72.  
 5 Notice of Kowalevsky's memoir.
- .687 Two New Genera of Pythonomorpha. *Amer. Nat.* Vol.  
 Jan. XVII, 1883, pp. 72, 73.  
 5 Comment on Dollo's paper, "Note sur l'osteologie des

- Mososauridæ," Bull. Mus. Roy. d'hist. nat. de Belgique, T. I., pp. 1-20, Pls. IV, V et VI.
- .688 Scudder on Triassic Insects. *Amer. Nat.* Vol. XVII, 1883,  
Jan. p. 73.  
5 Note on the age of the Red Beds near Fairplay, Colorado.
- .689 (Contemporaneity of Man and Pliocene Mammals). *Proc.*  
Jan. *Acad. Nat. Sci., Phila.* Vol. XXXIV, 1882, pp. 291, 292.  
16 See also 682 and note. Later discussion 746.
- .690 On *Uintatherium*, *Bathmodon* and *Trisodon*. *Proc. Acad.*  
Jan. *Nat. Sci. Phila.* Vol. XXXIV, 1882, pp. 294-300.  
16 For abstract see 683 and note.
- .691 (The Beastiarious). *Amer. Nat.* Vol. XVII, 1883, p. 175.  
Jan. Criticism of antivivisectionist activities. Unsigned editorial.  
31 Cited by Frazer.
- .692 Filhol's Fossil Mammals of Ronzon. *Amer. Nat.* Vol. XVII,  
Jan. 1883, pp. 190, 191.  
31 Review of "Étude des Mammifères fossiles de Ronzon  
(Haute Loire)," by M. H. Filhol.
- .693 New Mammalia from the Puerco Eocene. *Amer. Nat.*  
Jan. Vol. XVII, 1883, p. 191.  
31 *Helagras prisciformis* gen. et sp. nov.; *Pantolestes* pro-  
visionally placed in Artiodactyla with species "*Mioclaenus*"  
*brachystomus* and *etsagicus* referred to it. No other tenable  
description of new forms. Abstract of 695.
- .694 Zoölogical Geography of Western North America. *Science*  
Feb. Vol. I, No. 1, February 9, 1883, p. 21.  
9 Abstract of 697.
- .695 First Addition to the Fauna of the Puerco Eocene. *Proc.*  
Feb. *Amer. Philos. Soc.* Vol. XX, 1883, pp. 545-563. *Pal. Bull.*  
14 No. 36, pp. 545-563.  
In the full paper appears an extended description of "*Mio-  
clænus*" *ferox* (= *Clænodon*), compared here with carniv-  
orous marsupials (a view subsequently withdrawn by Professor  
Cope); of skeleton of *Pantolambda* for which a new sub-  
order of Amblypoda, Taligrada, is erected; of various new  
species, etc.; the Puerco mammals nearly all have tritubercu-  
lar molars, quadritubercular molar derived from this type.  
For description of *Pantolambda* see 702 and note. Also see  
note on dates of publication of the various pages of this  
article. In the *Proc. Amer. Philos. Soc.*, pp. 545-554 were  
printed February 14, 555-563 on March 16. *Bull.* published  
April 17. For abstract see 693.

- .696 Phylogeny of the Sirenia. *Science* Vol. I, No. 2, February  
 Feb. 16, 1883, p. 53.  
 16 Abstract of 706.
- .697 Notes on the Geographical Distribution of Batrachia and  
 Feb. Reptilia in Western North America. *Proc. Acad. Nat. Sci.*  
 20 *Phila.* Vol. XXXV, 1883, pp. 10-35.  
 See 694.
- .698 On the Extinct Dogs of North America. *Amer. Nat.* Vol.  
 Feb. XVII, 1883, pp. 235-249, figs. 1-14.  
 21 Key to extinct American genera; descriptions with figures  
 of principal forms from John Day and Loup Fork (some  
 figures afterwards in "Tertiary Vertebrata," others in "Un-  
 published Plates of Tertiary Vertebrata"). Phylogeny and  
 origin.
- .699 [Credit and Appropriation.] *Amer. Nat.* Vol. XVII, 1883,  
 Feb. pp. 293, 294.  
 21 Unsigned editorial. Cited by Frazer.
- .700 A New Fossil Sirenian. *Amer. Nat.* Vol. XVII, 1883, p. 309.  
 Feb. *Dioplotherium manigaulti* nov. gen. et sp. from Miocene  
 21 of S. Carolina. Abstract of 706 as is also 696.
- .701 Lydekker on Indian Mammalia. *Amer. Nat.* Vol. XVII,  
 March 1883, pp. 405, 406.  
 15 Critical review of *Pal. Indica*, Vol. III, Pts. I and III.
- .702 The Ancestor of *Coryphodon*. *Amer. Nat.* Vol. XVII, 1883,  
 March pp. 406, 407.  
 15 Skeleton characters of *Pantolambda*; referred to *Ambly-*  
*poda* new suborder; *Taligrada*, family *Pantolambdidae*. Ante-  
 dates by one day the pages of 695 dealing with this genus.
- .703 On the Brains of the Eocene Mammalia *Phenacodus* and  
 March *Periptychus*. *Proc. Amer. Philos. Soc.* Vol. XX, 1883, pp.  
 16 563-565, Pls. I, II. *Pal. Bull.* No. 36, pp. 563-565, Pls. I, II.  
 In *Phenacodus cerebrum* remarkably small; sylvian fissure  
 and traces of 3 convolutions present; cerebellum with dis-  
 tinct vermis and large lateral lobes. Olfactory lobes large,  
 well separated. In *Periptychus* olfactory lobes enormous,  
 mesencephalon wholly exposed, no sylvian fissure.
- .704 *Dimodipsas*, a New Venomous Snake. *Science* Vol. I, No. 7,  
 March March 23, 1883, p. 204.  
 23 From South America. See 710.
- .705 Permian Fishes and Reptiles from Texas. *Science* Vol. I,  
 March No. 7, March 23, 1883, p. 204.  
 23 Supposed to be a reprint of *Proc. Acad. Nat. Sci. Phila.*,  
 but in reality published first. See 711.

- .706 On a New Extinct Genus of Sirenia from South Carolina. *Proc. Acad. Nat. Sci. Phila.* Vol. XXXV, 1883, pp. 52-54.  
 March 27 For abstract see 696 and 700.
- .707 The Tritubercular Type of Superior Molar Tooth. *Proc. Acad. Nat. Sci. Phila.* Vol. XXXV, 1883, p. 56. Reprinted, "Note on the Trituberculate Type of Superior Molar and the Origin of the Quadrituberculate," *Amer. Nat.* Vol. XVII, 1883, pp. 407, 408.  
 March 27 The quadritubercular molar type derived from it. Predominant in Puerco Eocene.
- .708 Permian Reptiles. *Science* Vol. I, No. 8, March 30, 1883, p. 232.  
 March 30 Supposed to be a verbal communication at the Acad. Nat. Sci. Phila., March 13, 1883, but not to be found in the Proceedings.
- .709 Fourth Contribution to the History of the Permian Formation of Texas. *Proc. Amer. Philos. Soc.* Vol. XX, 1883, pp. 628-636. *Pal. Bull.* No. 36, pp. 628-636.  
 April 4 *Ectosteorhachis*, *Gnathorhija* gen. nov., *Chilonyx* gen. nov., and new species of *Empedias*: *Pariotichus megalops*. *Pariotichus-Pantylus-Ectocynodon* = new family *Pariotichida*.
- .710 On *Dinodipsas* and *Causus*. *Proc. Acad. Nat. Sci. Phila.* Vol. XXXV, 1883, p. 57.  
 April 10 For abstract see 704.
- .711 Permian Fishes and Reptiles. *Proc. Acad. Nat. Sci. Phila.* Vol. XXXV, 1883, p. 69. Abstract, *Amer. Nat.* Vol. XVII, 1883, p. 905.  
 April 10 See also 705.
- .712 [Scientific Publications of the United States Government.] *Amer. Nat.* Vol. XVII, 1883, pp. 515, 516.  
 April 18 Unsigned editorial. Cited by Frazer.
- .713 The Genus *Phnacodus*. *Amer. Nat.* Vol. XVII, 1883, p. 535, Pl. XII.  
 April 18 General characters, with figure, of skeleton found by Wortman in Bighorn basin of Wyoming; list of species of the genus.
- .714 Geology of Brazil. *Science* Vol. I, No. 13, May 4, 1883, pp. 367, 368.  
 May 4 This is supposed to be part of the *Proc. Acad. Nat. Sci. Phila.* for April 10, but is not in the volume for 1883.
- .715 The bunotherian Mammalia. *Science* Vol. I, No. 13, May 4, 1883, p. 372.  
 May 4 An abstract of 718 but first to be printed.



- .716 The Developmental Significance of Human Physiography.  
 May *Amer. Nat.* Vol. XVII, 1883, pp. 618-627, Pls. XIII-XV,  
 17 figs. 1-9.
- .717 [The National Academy of Sciences.] *Amer. Nat.* Vol.  
 May XVII, 1883, pp. 627, 628.  
 17 Unsigned editorial.
- .718 On the Mutual Relations of the Bunotherian Mammalia.  
 May *Proc. Acad. Nat. Sci. Phila.* Vol. XXXV, 1883, pp. 77-83.  
 22 Reprint, *Ann. & Mag. Hist.*, Ser. 5, Vol. XII, 1883, pp. 20-26.  
 For abstract see 715.
- .719 Characters of the Hadrosauridæ. *Science* Vol. I, No. 16,  
 May May 25, 1883, p. 468.  
 25 Intended as an abstract of 721 but printed first.
- .720 On a New Extinct Genus and Species of Percidæ from  
 June Dakota Territory. *Amer. Journ. Sci.* Ser. 3, Vol. XXV,  
 1883, pp. 414-416.  
*Plioparchus* Nov. Gen., and *P. whitei* and *P. sexspinosus*  
 N. Sp.
- .721 On the Characters of the Skull of the Hadrosauridæ. *Proc.*  
 June *Acad. Nat. Sci. Phila.* Vol. XXXV, 1883, pp. 97-107, Pls.  
 5 IV-VII. Abstract, "The Structure and Appearance of a  
 Laramie Dinosaurian." *Amer. Nat.* Vol. XVII, 1883, pp.  
 774-777, Pls. XVI-XIX, & pp. 1000, 1001.  
 See also 719.
- .722 The Unification of Geological Nomenclature and Cartog-  
 June raphy. *Amer. Nat.* Vol. XVII, 1883, pp. 764, 765.  
 20 Unsigned editorial. Cited by Frazer.
- .723 On some Vertebrata from the Permian of Illinois. *Proc.*  
 June *Acad. Nat. Sci. Phila.* Vol. XXXV, 1883, pp. 108-110.  
 26 *Thoracodus emydinus* Nov. Gen. et Sp., and *Ctenodus*  
*heterolophus* and *C. vasabinsis* N. Sp.
- .724 Puerco Beds in France. *Science* Vol. II, No. 22, July 6,  
 July 1883, p. 20.  
 6 Supposed to be a verbal communication at the Academy of
- .725 A New Hydroid Polyp. *Science* Vol. II, No. 22, July 6,  
 July 1883, p. 22.  
 6 In reality one paragraph of 732, p. 140. It appeared be-  
 fore the entire article, however.
- .726 Extinct fauna of Idaho and Oregon. *Science* Vol. II, No.  
 July 23, July 13, 1883, p. 56.  
 13 An abstract of 732 but published before the article.

- .727 Late Works on Evolution. *Amer. Nat.* Vol. XVII, 1883,  
 July pp. 855-858.  
 16 Review of: The Theories of Darwin and Their Relation  
 to Philosophy, Religion and Morality, by Rudolf Schmid;  
 Final Causes, by Paul Janet; A Critique of Design-argu-  
 ments, etc., by L. E. Hicks; Development, what it can do  
 and what it cannot do, by James McCosh; Natural Selec-  
 tion and Natural Theology, a discussion between Dr. Romanes  
 and Dr. Asa Gray, *Nature* Vol. XXVI, 1883.
- .728 A New Pliocene Formation in the Snake River Valley.  
 July *Amer. Nat.* Vol. XVII, 1883, pp. 867, 868.  
 16 Willow Creek, in Eastern Oregon.
- .729 The "Third Trochanter" of the Dinosaurs. *Amer. Nat.* Vol.  
 July XVII, 1883, p. 869.  
 16 Unsigned. Cited by Hay. A summary of Dollo's article  
 in *Bull. Mus. R. Hist. Nat. Belg.* T. I. Mars, pp. 13-18, Pl. I.
- .730 The Puerco Fauna in France. *Amer. Nat.* Vol. XVII, 1883,  
 July pp. 869, 870.  
 16 A critical summary of Lemoine's "Recherches sur les  
 oiseaux fossils des terrains tertiaires inférieurs des environs  
 de Reims." Part II. For abstract see 724.
- .731 The Fishes of the Batsto River, New Jersey. *Proc. Acad.*  
 July *Nat. Sci. Phila.* Vol. XXXV, 1883, pp. 132, 133. Abstract,  
 24 *Science* Vol. II, No. 26, p. 149.  
 Eleven species listed and *Amiurus prosthistius* N. Sp. de-  
 scribed.
- .732 On the Fishes of the Recent and Pliocene Lakes of the  
 Aug. Western Part of the Great Basin, and of the Idaho Pliocene  
 7 Lake. *Proc. Acad. Nat. Sci. Phila.* Vol. XXXV, 1883, pp.  
 134-166 and Map. Abstract, "Fossil Fishes from Idaho,"  
*Amer. Nat.* Vol. XVII, 1883, p. 1321.  
 Faunal list with descriptions of fishes of this region in-  
 cluding descriptions of 6 new species of recent fishes and 9  
 new species out of 22 fossil forms. For an earlier pub-  
 lished abstract see 725 and 726.
- .733 The Evolutionary Significance of Human Character. *Amer.*  
 Aug. *Nat.* Vol. XVII, 1883, pp. 907-919.  
 15 A continuation of 716.
- .871 Jordan's Catalogue of Fishes of North America. *Amer. Nat.*  
 Aug. XVII, 1883, p. 967.  
 15 Review of anniversary address to the Geol. Soc. London.  
 Unsigned. Given on Dr. Matthew's authority.

- .735 Some New Mammalia of the Puerco Formation. *Amer. Nat.*  
 Aug. Vol. XVII, 1883, p. 968.
- 15 Additional remains of *Periptychus ditrigonus* show that it  
 belongs to *Conoryctes*, probably family Periptychidæ. Three  
 new species named, genus *Zetodon* (new) defined. Unsigned.  
 Given on Dr. Matthew's authority. See 741.
- .736 Geological Notes. *Amer. Nat.* Vol. XVII, 1883, pp. 968, 970.  
 Aug. Notices of various new publications chiefly on vertebrate  
 15 palæontology. Unsigned. Cited by Hay.
- .737 The Evidence for Evolution in the History of the Extinct  
 Aug. Mammalia. *Science* Vol. II, 1883, pp. 272-279. Reprint,  
 31 *Nature* Vol. XXIX, 1884, pp. 227-230; 248-250. Reprint,  
*Proc. A. A. A. S.*, XXXII Meeting, 1883, pp. 32-48. Ab-  
 stract, "Progress of the Ungulates in Tertiary Time," *Amer.*  
*Nat.* Vol. XVII, 1883, pp. 1055-1057.  
 The paper was originally read before the A. A. A. S. but  
 not printed in the proceedings (see the second reprint) until  
 1884.
- .738 The Structure of the Skull in *Diclonius mirabilis*, a Laramie  
 Sept. Dinosaurian. *Science* Vol. II, 1883, p. 338. *Proc. A. A.*  
*A. S.*, XXXII Meeting, 1883, pp. 315, 316.  
 Abstract only of paper read before the A. A. A. S. For  
 other papers on *Diclonius* see 719, 721.
- .739 Two primitive Types of Ungulata. *Science* Vol. II, 1883,  
 Sept. p. 338. Abstract, "On two primitive types of Ungulatæ,"  
 7 *Proc. A. A. A. S.*, XXXII Meeting, 1883, p. 316.  
 Abstracts of a paper read before the A. A. A. S. but not  
 printed in the proceedings until 1884.
- .740 The Trituberculate Type of Superior Molar, and the Origin  
 Sept. of the Quadrituberculate. *Science* Vol. II, 1883, September  
 7, p. 338.  
 Abstract of 760. See also 707.
- .741 On some Fossils of the Puerco Formation. *Proc. Acad.*  
 Sept. *Nat. Sci. Phila.* Vol. XXXV, 1883, pp. 168-170. Abstract,  
 18 "Some New Mammalia of the Puerco Formation," *Amer.*  
*Nat.* Vol. XVII, 1883, p. 968.  
 See 735. Probably an abstract.
- .742 Weismann's Studies in the Theory of Descent. *Amer. Nat.*  
 Oct. Vol. XVII, 1883, pp. 1042-1046.  
 Unsigned. Cited by Frazer. Review of: Studies in the  
 Theory of Descent, by Dr. August Weismann. Translated  
 and edited, with notes by Raphael Meldola, etc.

- .743 Geological Notes. *Amer. Nat.* Vol. XVII, 1883, pp. 1057,  
Oct. 1058.  
Notices of various papers chiefly on vertebrate palaeontology. Unsigned. Cited on Dr. Matthew's authority.
- .744 [The Work of the Mutual Autopical Society.] *Amer. Nat.*  
Oct. Vol. XVII, 1883, pp. 1138, 1139.  
19 Unsigned editorial. Cited by Frazer.
- .745 A new Chondrosteian from the Eocene. *Amer. Nat.* Vol.  
Oct. XVII, 1883, pp. 1152, 1153.  
19 *Crassopholis magnicaudatus* gen. et sp. nov. from Green River formation of Wyoming.
- .746 The Carson Footprints. *Amer. Nat.* Vol. XVII, 1883, p.  
Oct. 1153.  
19 For earlier discussions see 682 and 689.
- .747 Letter from Little Missouri, Dakota. *Proc. Amer. Philos.*  
Oct. *Soc.* Vol. XXI, 1883, pp. 216, 217. Reprinted, *Pal. Bull.* No.  
30 37, pp. 216, 217, as "On a New Basin of White River Age in Dakota."  
Geological notes, list of species of fossil vertebrates.
- .748 [Government Aid to Science.] *Amer. Nat.* Vol. XVII,  
Nov. 1883, pp. 1258, 1259.  
28 Unsigned editorial.
- .749 A New Snake from Mexico. *Amer. Nat.* Vol. XVII, 1883,  
Nov. pp. 1300, 1301.  
28 *Atomarchus multimaculatus*.
- .750 The Laramie Formation. *Amer. Nat.* Vol. XVII, 1883, p.  
Nov. 1320.  
28 Supposedly an abstract of the meeting of the Acad. Nat. Sci. Phila. on June 12. No such communication by Cope is recorded in the proceedings.
- .751 The Batrachia of the Permian Period of North America.  
Dec. *Amer. Nat.* Vol. XVIII, 1884, pp. 26-39, Pls. II-V, figs. 1-7.  
29 Classification, phylogeny of the groups, review of principal American Permian genera with illustrations; discussion of vertebral construction.
- .752 Mechanical Evolution. *Amer. Nat.* Vol. XVII, 1884, pp.  
Dec. 40, 41.  
29 Editorial on Darwin's "Origin of Species."
- .753 The Loup Fork Beds on the Gila River. *Amer. Nat.* Vol.  
Dec. XVIII, 1884, pp. 58, 59.  
29 Abstract of 758. Description of the formation. Age determined by a skull of *Aphelops fossiger* Cope.

- .754 On New Lemuroids from the Puerco Formation. *Amer. Nat.*  
 Dec. Vol. XVIII, 1884, pp. 59-62.
- 29 Key to classification. *Tricentes* and *Indrodon* new genera described.
- 1884.755 The Vertebrata of the Tertiary Formations of the West. Book I. *Report, U. S. Geol. Survey of the Territories* (Hayden). Vol. III, pp. i-xxxv, 1-1009, Pls. I-LXXVa.  
 This volume contains only the first half of Cope's final report to the Hayden Survey upon the Tertiary Mammalia. It includes the Eocene faunas and a part of the Oligocene (Lower Miocene) Rodentia and Insectivora, etc., Carnivora. The second half, to include the Oligocene ("Lower Miocene") Ungulata and the Miocene ("Loup Fork") fauna, was never published, although a large part of the plates were made and printed. (See 1395.) Forty-two fishes are described, belonging to eleven genera, and are shown in 185 figures on 14 plates.
- .756 An Account of the Mammalian Fauna of the Post-pliocene Deposits in the State of Indiana. (With J. L. Wortman.) *Fourteenth Ann. Report* (Dept. Geol. and Nat. Hist.), *Survey of Indiana*, John Collet, State Geologist, Pt. II, Palaeontology, 1884, pp. 1-41, Pls. I-VI.
- .757 Genus *Equus*. *Fourteenth Ann. Report* (Dept. Geol. and Nat. Hist.), *Survey of Indiana*, John Collet, State Geologist, Pt. II, Palaeontology, 1884, pp. 40, 41. Appendix to 756.
- .758 On the Distribution of the Loup Fork Formation in New  
 Jan. Mexico. *Proc. Amer. Philos. Soc.* Vol. XXI, 1883, pp.  
 2 308, 309. *Pal. Bull.* No. 37, pp. 308, 309.  
 For abstract see 753. Headwaters of Gila R. and San Francisco about 500 feet thickness. Also probably along eastern base of Magdalena mountains.
- .759 Second Addition to the Knowledge of the Puerco Epoch.  
 Jan. *Proc. Amer. Philos. Soc.* Vol. XXI, 1883, pp. 309-324.  
 2 *Pal. Bull.* No. 37, pp. 309-324.  
 Several new species described; extended description of *Tricentes* and *Indrodon*; *Chirox* described as new genus; synopsis of the Eocene lemuroid genera; characters of the fauna—tritubercular bunodont teeth and plantigrade pentadactyl feet.
- .760 On the Trituberculate Type of Molar Tooth in the Mam-  
 Jan. malia. *Proc. Amer. Philos. Soc.* Vol. XXI, 1883, pp. 324-  
 2 326. *Pal. Bull.* No. 37, pp. 324-326. *Proc. A. A. A. S.*  
 XXXII Meeting, 1883, pp. 313-315.

Viewed as the primitive type from which are derived the later types of mammalian molars. Of these papers the Pal. Bull. was the first to be issued, its pagination being, as usual, that of the Philos. Soc. Both these differ in only the minutest detail from the Proc. A. A. A. S., so that it seems inadvisable to regard that, published in 1884 also as a separate article. For abstract see 740.

- .761 [The Society of Naturalists of the Eastern United States.]  
Jan. *Amer. Nat.* Vol. XVIII, 1884, pp. 160, 161.  
21 Unsigned editorial. Cited by Frazer.
- .762 Mission Scientifique au Mexique; Recherches zoologiques;  
Jan. Trois. Partie, Rech. sur les Reptiles et les Batracchiens, par  
21 MM. Duméril et Bocourt. *Amer. Nat.* Vol. XVIII, 1884,  
pp. 162, 163.  
Review.
- .763 Results of the Deep-sea Work of the "Talisman." *Amer.*  
Jan. *Nat.* Vol. XXVIII, 1884, p. 177.  
21
- .764 On Extinct Rhinoceri from the Southwest. *Proc. Acad.*  
Jan. *Nat. Sci. Phila.* Vol. XXXV, 1883, p. 301.  
29
- .765 The History of the Oreodontidæ. *Amer. Nat.* Vol. XVIII,  
Feb. 1884, pp. 280-282.  
17 Abstract of 786, printed before the article. Review of the  
genera and list of species with phyletic relations and geologic  
occurrence.
- .766 The Creodonta. *Amer. Nat.* Vol. XVIII, 1884, pp. 255-267;  
Feb. 344-353; 478-485, figs. 1-30.  
17 Affinities, classification, review of principal known genera  
with illustrations. The discussion of the affinities of the  
Creodonta with Marsupials, Insectivora, etc., is an admirable  
example of sound reasoning in comparative anatomy, and of  
clear and condensed presentation of the salient points of the  
evidence then available. The pages appeared successively in  
the March (published Feb. 17), April (published March 15),  
and May (published April 19) numbers of the *Amer. Nat.*
- .767 [The Law and Insanity.] *Amer. Nat.* Vol. XVIII, 1884,  
Feb. pp. 267-269.  
17 Editorial.
- .768 Professor Owen on Fossil Mammals. *Amer. Nat.* Vol.  
Feb. XVIII, 1884, p. 283.  
17 Unsigned but in the index of the volume under Cope.  
Notice of Owen's descriptions of *Scapanodon* from the Pleis-

- tocene of Australia (*Philos. Trans.*, Pt. 1, pp. 245-248, Pl. 12), and *Tritylodon* from the Trias of South Africa (*Quart. Journ. Geol. Soc.*, London, Vol. XL, pp. 146-156, Pl. VI). The latter is allied to *Meniscoëssus* and *Polymastodon*.
- .769 Filhol on Eocene Lemuroids. *Amer. Nat.* Vol. XVIII, 1884,  
Feb. p. 283.  
17 Note upon supposed identity of *Anaptomorphus* with *Necrolemur* and of *Notharctus* with *Adapis*. Filhol's paper, *Ann. Sci. géol.* Vol. 14.
- .770 The Diseases of the Will. *Amer. Nat.* Vol. XVIII, 1884,  
Feb. pp. 317, 318.  
17 Review of: Diseases of the Will, by Th. Ribot; Humboldt Library No. 52.
- .771 A Carboniferous Genus of Sharks still living. *Science* Vol.  
March III, No. 57, March 7, 1884, pp. 275, 276.  
7 *Chlamydoselachus-Didymodus*. See also 773, 782 and 792.
- .772 [Natural Science in Philadelphia.] *Amer. Nat.* Vol.  
March XVIII, 1884, pp. 393-395.  
15 Unsigned editorial. Cited by Frazer.
- .773 The Skull of a Still Living Shark of the Coal Measures.  
March *Amer. Nat.* Vol. XVIII, 1884, pp. 412, 413.  
15 See 771 for the first note on *Didymodus*.
- .774 Philadelphia Academy. *Amer. Nat.* Vol. XVIII, 1884, pp.  
April 510, 511.  
19 Unsigned editorial. Under Cope in volume index.
- .775 Garman's North American Reptiles and Batrachians. *Amer.*  
April *Nat.* Vol. XVIII, 1884, pp. 513-515.  
19 Review of: A List of the Species occurring North of the Isthmus of Tehuantepec, with references. From the Bulletin, Essex Institute, Salem, Jan. 1884. On the Reptiles and Batrachians [of the Kentucky Geological Survey]. From Memoirs, Museum of Comparative Zoölogy, Cambridge, 4to. (no date). Unsigned. Cited by Frazer.
- .776 The Mastodons of North America. *Amer. Nat.* Vol. XVIII,  
April 1884, pp. 524-526. Abstract ("Different Species of Masto-  
19 dons,") *Science* Vol. III, No. 65, May 2, 1884, pp. 553, 554.  
Key to the American species; description of new forms. The abstract is supposed to be a verbal communication before the Acad. Nat. Sci. Phila., March 22, but is not recorded in the Proceedings.

- .777 Marsh on *Diplodocus*. *Amer. Nat.* Vol. XVIII, 1884,  
 April p. 526.  
 19 Critical notice of Marsh's paper in *Amer. Journ. Sci.*
- .778 The Pelvisternum of Edentates. *Amer. Nat.* Vol. XVIII,  
 May 1884, pp. 639, 640.  
 17 Review of Albrecht's paper. Unsigned. Cited by Hay.
- .779 The Practical Type of Mind. *Amer. Nat.* Vol. XVIII,  
 May 1884, p. 644.  
 17
- .780 The Tertiary Marsupialia. *Amer. Nat.* Vol. XVIII, 1884,  
 May pp. 686-697, figs. 1-9.  
 17 *Didelphidæ* and *Multituberculata*. Classification of Multi-  
 tuberculates, description of principal forms with illustrations;  
 phylogeny.
- .781 [Note on the Collections in the Muséo Nacional.] *Proc.*  
 May *Amer. Philos. Soc.* Vol. XXI, 1884, p. 487.  
 29
- .782 *Pleuracanthus* and *Didymodus*. *Science* Vol. III, No. 69,  
 May May 30, 1884, pp. 645, 646.  
 30 See also 771 and 792.
- .783 [Zoology in the National Parks.] *Amer. Nat.* Vol. XVIII,  
 June 1884, pp. 708, 709.  
 17 Unsigned editorial. Cited by Frazer.
- .784 Lydekker on Extinct Mammalia of India. *Amer. Nat.* Vol.  
 June XVIII, 1884, pp. 717, 718.  
 17 Critical review of: *Memoirs, Geological Survey of India*,  
 Ser. X, Vol. II, *Siwalik Camelopardalidæ*, and *Siwalik and*  
*Narbada Carnivora* (Parts IV and VI); Vol. III *Additional*  
*Perissodactyla and Proboscida* (Part I).
- .785 Notes on Abnormal Deer Antlers. *Amer. Nat.* Vol. XVIII,  
 June 1884, pp. 737, 738.  
 17 Editorial note on communication by J. D. Caton.
- .786 Synopsis of the Species of *Oreodontidæ*. *Proc. Amer. Philos.*  
 July *Soc.* Vol. XXI, 1884, pp. 503-572, two figs. *Pal. Bull.* No. 38,  
 1 pp. 503-572, two figs.  
 Synopsis of family characters and affinities, key to genera;  
 principal characters of each genus, diagnoses and synonymy  
 of species in each. Fifteen new species or subspecies described  
 and extended or revised descriptions of a number of others.  
 Affinities of genera, geological distribution. For abstract see  
 765.



- .787 On the Structure of the Skull in the Elasmobranch Genus  
 July *Didymodus*. *Proc. Amer. Philos. Soc.* Vol. XXI, 1884,  
 17 pp. 572-590, one plate. *Pal. Bull.* No. 38, pp. 572-590, one  
 plate.  
 Description of partial skull in Cope Collection from Per-  
 mian of Texas.
- .788 The Condylarthra. *Amer. Nat.* Vol. XVIII, 1884, pp. 790-805;  
 July 892-906, Pls. XXVIII-XXX and figs. 1-28.  
 17 Affinities, classification, description of principal forms with  
 illustrations. The article appeared in the August number  
 (published July 17) and the September number (published  
 August 15) successively.
- .789 [An International Scientific Association.] *Amer. Nat.* Vol.  
 July XVIII, 1884, pp. 805, 806.  
 17 Editorial.
- .790 The Duke of Argyll's Unity of Nature. *Amer. Nat.* Vol.  
 July XVIII, 1884, pp. 807, 808.  
 17 Review of: The Unity of Nature, by the Duke of Argyll.  
 Unsigned. Cited by Frazer.
- .791 The *Choristodera*. *Amer. Nat.* Vol. XVIII, 1884, pp. 815-817.  
 July Critique of: Etude sur les caractères génériques du  
 17 Simædosaur reptile nouveau de la faune Cernaysienne etc.  
 par Dr. Lemoine, 1884. Probably = *Champsosaurus*; position  
 of this group of fossil reptiles.
- .792 The Genus *Pleuracanthus*. *Amer. Nat.* Vol. XVIII, 1884,  
 July p. 818, Pl. XXIII.  
 17 Figures of specimens from Texas Permian. See 771 for  
 first note.
- .793 Zoological Nomenclature. *Amer. Nat.* Vol. XVIII, 1884,  
 Aug. pp. 906-908.  
 15 Unsigned editorial. Given under Cope in index of volume.
- .794 Scientific Illustrations. *Amer. Nat.* Vol. XVIII, 1884,  
 Aug. p. 908.  
 15 Unsigned editorial. Given under Cope in index of volume.
- .795 (The Age of some Formations in the Banks of the Rio  
 Aug. Grande). *Proc. Amer. Philos. Soc.* Vol. XXI, 1884, p.  
 24 615.
- .796 Observations on the Phylogeny of the Artiodactyla derived  
 Sept. from American Fossils. *Amer. Nat.* Vol. XVIII, 1884,  
 15 pp. 1034-1036.  
 An advance abstract of 807. It is composed of the para-  
 graphs from the bottom of p. 25 to end of that paper, com-

- prising the author's views of this date in regard to the phylogeny of the families.
- .797 On Catagenesis. *Amer. Nat.* Vol. XVIII, 1884, pp. 970-984.  
 Sept. *Proc. A. A. A. S.* XXXIII Meeting 1884, pp. 455-470. Ab-  
 15 stract, "Catagenesis; or, Creation by Retrograde Metamorphosis of Energy", *Science* Vol. IV, No. 84, Sept. 12, 1884, pp. 240-243.  
 Corollary to the doctrines of archæsthetism, etc., discussed in a previous number of the *Amer. Nat.* The abstract in *Science* appeared three days previous to the original in the *Amer. Nat.* The *Proc. A. A. A. S.* were not published until 1885.
- .798 Scientific Contracts. *Amer. Nat.* Vol. XVIII, 1884, p.  
 Sept. 1013.  
 15 Unsigned editorial. Under Cope in index of volume.
- .799 Phylogeny of the artiodactyle *Mammalia*. *Science* Vol. IV,  
 Oct. No. 87, Oct. 3, 1884, p. 339.  
 3 An abstract of 807. See also 796 and note.
- .800 On the Saurians of the Permian Epoch. *Science* Vol. IV,  
 Oct. No. 87, Oct. 3, 1884, p. 340.  
 3 Abstract of paper in *Proc. A. A. A. S.*
- .801 The Amblypoda. *Amer. Nat.* Vol. XVIII, 1884, pp. 1110-  
 Oct. 1121; 1192-1202; Vol. XIX, 1885, pp. 40-55, Pl. I; figs. 1-35.  
 20 Ordinal characters, classification, affinities of other ungu-  
 late orders; descriptions of principal known types with illus-  
 trations. The pages appeared successively in the Novem-  
 ber number (published Oct. 20), the December number (pub-  
 lished Nov. 19) and the January number of 1885 (published  
 Dec. 30, 1884).
- .802 Note on Acceleration in Deer Antlers. *Amer. Nat.* Vol.  
 Oct. XVIII, 1884, p. 1160.  
 20 See also 785.
- .803 The American Association for the Advancement of Science.  
 Oct. *Amer. Nat.* Vol. XVIII, 1884, pp. 1121, 1122.  
 20 Unsigned editorial. Under Cope in the index of volume.
- .804 Catalogue of Aquatic Mammals of the United States by F.  
 Oct. W. True. *Amer. Nat.* Vol. XVIII, 1884, pp. 1123, 1124.  
 20 Review with criticism.
- .805 The Origin of the *Mammalia*. *Amer. Nat.* Vol. XVIII,  
 Oct. 1884, pp. 1136, 1137.  
 20 Derived from primitive reptilia, the Permian Pelycosauria

- approximately represent the ancestral type. Abstract of 819 and 808.
- .806 The Extinct Mammalia of the Valley of Mexico. *Proc. Amer. Philos. Soc.* Vol. XXII, 1884, pp. 1-21. *Pal. Bull.* No. 39, pp. 1-21. Reprinted in Spanish "Los mamíferos del valle de México ya extinguidos." *Anales, Museo Nacional, Mexico*, T.III, 10a, pp. 335-344, 1886.
- Based upon study of collections in National and School of Mines Museums of Mexico. Revision of the species of Mastodon, dividing into 3 genera, *Dibelodon*, gen. nov. type *M. shepardi*, Leidy, *Tetrabelodon* gen. nov. type *M. angustidens* Cuv, upon characters of incisors. *Equus*, key to species and descriptions of two new forms; Camelidæ, key to later genera, *Eschatius* gen. nov.
- .807 On the Structure of the Feet in the Extinct Artiodactyla of North America. *Proc. Amer. Philos. Soc.* Vol. XXII, 1884, pp. 21-27. *Pal. Bull.* No. 39, pp. 21-27. *Proc. A. A. S.* XXXIII Meeting, 1884, pp. 482-489.
- Concise account of principal features of structure of feet in American Tertiary genera; discussion of affinities and evolution; phylogeny of families. For abstract see 796 and 799.
- .808 Fifth Contribution to the Knowledge of the Fauna of the Permian Formation of Texas and the Indian Territory. *Proc. Amer. Philos. Soc.* Vol. XXII, 1884, pp. 28-47, Pl. I. *Pal. Bull.* No. 39, pp. 28-47, Pl. I.
- Description of specimens of *Clepsydrops*, *Cricotus* and *Edaphosaurus*; posterior foot structure in Pelycosauria shows marked affinities to mammalia, especially monotremes; columella auris and quadrate in *Clepsydrops leptcephalus* (postea *Diopseus* Cope = *Theropleura* auct. Case) constructed on pattern distinctly approaching mammalia; articulation of ribs in *Embolophorus* mammaloid; reason for believing that the Mammalia are descendants of the Pelycosauria.
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