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OF

HENRY FAIRFIELD OSBORN

1857-1935

BY

WILLIAM K. GREGORY

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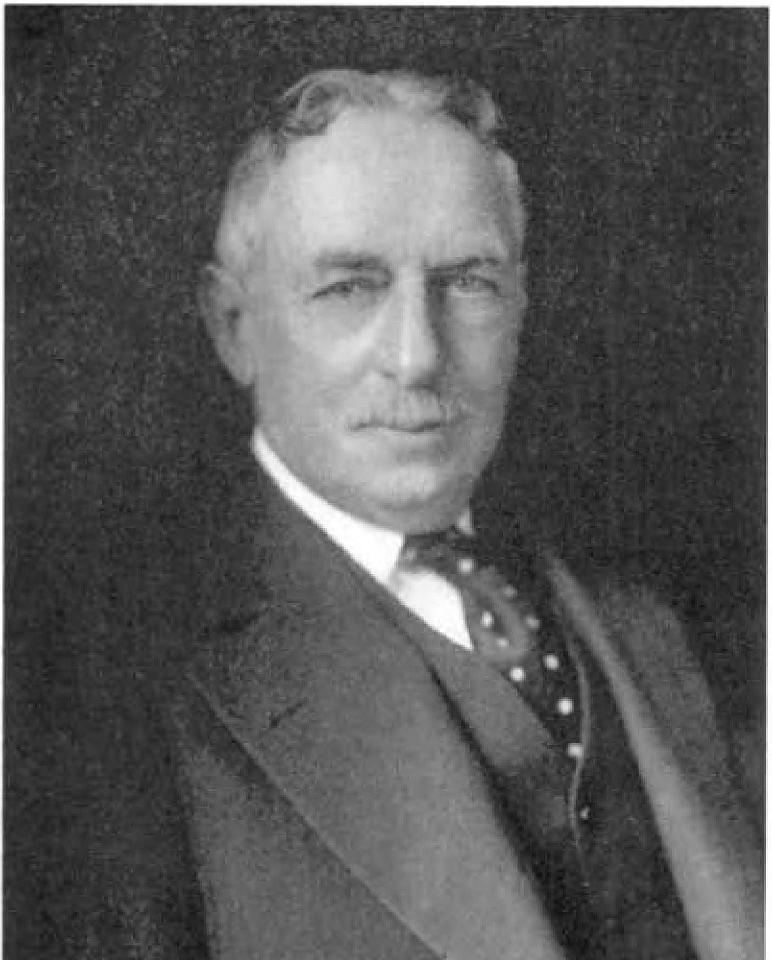

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Henry Fairfield Osborn was born at Fairfield, Connecticut, August 8, 1857, the second child and eldest son of William Henry Osborn and Virginia Reed Osborn, née Sturges, both of New England stock. The early American Osborns are recorded in several Massachusetts towns, particularly in Salem. The Sturges family had "lived for generations" in Fairfield, Connecticut. One of his mother's ancestors, the Reverend Ebenezer Pemberton, a prominent divine, was a founder of the College of New Jersey (Princeton University). His maternal grandfather, Jonathan Sturges, was a prominent merchant in New York.

His father, although the son of a man of property, had left school at an early age and entered an East Indian trading house in Boston. Sent as their representative to Manila, he was soon in business there for himself. Later he was connected with the Illinois Central Railroad and eventually became its long-term president, engineering it through the panic of 1857 and gradually building up a considerable fortune.

It will be noted that Henry Fairfield Osborn was born in the year of the great panic and four years before the beginning of the Civil War. Although he received his middle name from the town of his mother's ancestors, his parents lived for the most part in New York City, where they were among the "first families."

Henry Fairfield attended the Columbia Grammar School in New York City, where, according to his own recollections, the discipline was rigid.

The summer home of the family was at Garrison, N. Y., near the base of a mountain in the highlands of the Hudson River. There he and his brothers rode and walked along the mountain paths. One of his brothers, who was drowned in the Hudson River near Garrison while still a youth, had made a collection of local birds which was later presented to the American Museum of Natural History in New York. Henry Fairfield, however, unlike most boys who became famous naturalists, does not

appear to have been a "born collector" of insects, rocks, plants or animals. Nor do we hear of his doing other things that implied the patient acquisition of manual skill. His greatness was to be developed in a quite different way.

Later his father built a new and greater mansion on the summit of the same mountain, overlooking the Hudson River, opposite West Point. It would be hard to find anywhere a more delightful view of placid river and rounded mountains than that which is seen from the gray towers of "Castle Rock." Up the winding road to this castle came many American and foreign guests, including men and women who were eminent in science, literature, art and education. But whether at Garrison or in New York City, Henry Fairfield lived in a highly selective social environment which was in many essentials similar to that of the English upper classes; this environment doubtless prepared him in part for his later successful relations with his English friends and colleagues; it also helped to develop the quality of leadership, which was of the utmost importance in his life.

William Henry Osborn gave his sons every advantage and was ready to help them at critical times, yet he took care to train them in habits of industry and self reliance. Thus he encouraged Henry Fairfield, when the latter was a shy and retiring youth of fourteen years, to start "The Boys' Journal", of which thirteen numbers were published. The boy and his fellows prepared the copy, set up and printed the magazine. In his old age Osborn spoke of this experience as a great training in self reliance.

In commenting on the present biographical memoir, Professor Osborn's brother, Mr. William Church Osborn, under date of August 5, 1937, writes as follows:

"His father took a very liberal view of my brother's scientific work and encouraged him in it as far as he could and I think he had him take a year in an office to give him some business experience. He built for my brother the Woodsome Lodge at Castle Rock in which my brother did a large part of his creative work. I think the most important part though was his own example as a persistent, hard-working, hard-driving man of affairs, coupled with an unusual breadth of view on the problems

of the time. I think his example had a great effect on my brother's life."

Henry Fairfield's mother, Virginia Sturges Osborn, was a woman of genuine piety and humanity, who took a prominent part in works of charity and devotion in New York. Concerning the influence of Osborn's mother upon her son, his brother, William Church Osborn, in answer to an inquiry from the Reverend Henry S. Coffin, wrote as follows (December 3, 1935):

"I like to think that the 'long background which explains a man's view' was, in my brother's case, the deeply religious nature of my mother and the training which she gave my brother both by precept and example. She gave a great deal of time to him through his boyhood and said to me once that he was 'the child of many prayers'. I never talked with him on these subjects but my feeling is that with a religious spirit inherited from his mother and his grandfather, Jonathan Sturges, he had the added force of the precept and example of his mother during his formative years."

From the personal influence of both his parents he doubtless derived somewhat of his sincerity and directness, his lack of guile, his urbanity, his loyalty in friendship and his appreciation of loyalty in others. And under the guidance of his parents and teachers, his pastors and friends, he absorbed many of the best features of the religious and social environments of New England, of the "Old New York" families and of the Scotch Presbyterians.

AT PRINCETON

After being prepared for Princeton at the Collegiate Institute in New York, he became a student at that ancient stronghold of democracy and Presbyterianism in the days of the famous Dr. McCosh. A number of the essays of his senior year are preserved. His handwriting at this period was close to its definitive and nearly constant form, which was later described by a French colleague as *"le main magistral de M. Osborn."* If he had ever struggled with timidity and an inferiority complex, if he had ever had occasion to regret impetuous actions, this ponderous handwriting, with its deliberate and very distinguished letters,

its implied earnestness and sincerity, suggests that he had himself well in hand.

One of his essays of this period includes an attempted refutation of the "atheists' argument" that an all-wise and benevolent God would never have permitted evil in the world nor have condemned multitudes of the poor creatures of his own hand to a burning hell. His argument in brief is that, for reasons unknowable to mortals, salvation can be attained only by unceasing effort; this indeed was the theme of his life.

Dr. McCosh knew well not only how to inspire respect for religion in his students but even how to reconcile religion and science. It is said that he was the first Presbyterian divine in America to accept evolution as God's method of creation. And his pupil Henry Fairfield Osborn defended the same thesis. Dr. McCosh was essentially a religious philosopher and teacher, concerned with the relations of mind and matter and the problem of man's origin, fall and redemption. He had a great part in making Osborn also primarily a philosopher and teacher who consistently fought for "idealism" in opposition to "materialism" of the type exemplified by Ernst Haeckel.

As to the sources of his own scientific career, Osborn, in his frank and sincere autobiography,[1] tells us that "throughout this exposition [of his fifty-two years of activity in different fields of science] there is no indication of a predisposition on my part to this life of research; in my school and early life I was never conscious of such a predisposition nor am I able in a review of my ancestry and of my own boyhood to account for my life vocation. My boyhood and youth were similar to those of almost any other boy, undistinguished by a display of the driving force which from the moment of its awakening in the junior year of my Princeton days, has ever impelled me with constantly increasing power. The impulse which led me to dedicate my life to research must truly have come from within. . . . Thus, except for a few early statistics, my biography actually begins with the first call to biology and geology."

This passage reflects, even though indirectly, his life-long leanings toward predetermination, especially by heredity, his

[1] "Fifty-two Years of Research, Observation and Publication: 1877-1929," p. 151.

belief in "creative evolution," in a somewhat mystical sense, and his strong disbelief in "chance" as a factor in personal history.

A more pragmatic account of the young Osborn's "first call" to a life of science has been given in detail by his partner, Professor W. B. Scott. The gist of the matter was that three students in Professor Guyot's geology course, H. F. Osborn, W. B. Scott, and Francis Speir, Jr., determined not to let Yale University have a monopoly in fossil-hunting expeditions in the West. They wisely began by making a preliminary geological reconnaissance of the Highlands of the Hudson River. When Osborn was twenty years old they initiated and carried to a successful conclusion the "Princeton Scientific Expedition of 1877." Under the direction of Professor Kargé, they made collections of fossil fishes and plants in Colorado and of fossil mammals in the Eocene formation near Fort Bridger.

During the ensuing year, as graduate students in the E. M. Museum of Geology and Archaeology, they worked the fossils out of the matrix, searched the reports already published by Leidy, Cope and Marsh, compiled a systematic catalogue of the Eocene Vertebrates of Wyoming, made the drawings and wrote the descriptions of the new material.

In their letter of transmittal of the report[2] to Professor Arnold Guyot, Director of the E. M. Museum of Princeton, they observe:

"Now that the present work is ready for the press, we are very sensible that it must contain errors, which, while they have escaped our notice, will be readily detected by eyes more experienced. These, we trust, will be excused when it is remembered that we are just entering a field which others have explored for years, and opening a work which Princeton, with her many other lines of study, has never hitherto attempted." They also express their "gratitude to Professors Leidy and Cope for their generous aid, both in the way of advice and of material put in our hands for comparison." Thus began the friendly relations with Professors Leidy and Cope, which were to be of great aid to the young palaeontologists in the years to come.

[2] "Palaeontological Report of the Princeton Scientific Expedition of 1877," by Henry F. Osborn, Wm. B. Scott, and Francis Speir, Jr. Contrib. E. M. Mus. Geol. and Archaeol. of Princeton College, No. 1. 1878.

The plates illustrating the report were based on original drawings, mostly by Osborn. They reveal high ability to grasp and record the subtle contours of fossil bones and teeth.

The fossil mammals described represented families upon which Osborn and Scott later spent years of research. There were primates, creodonts or archaic carnivores, perissodactyls, artiodactyls, amblypods, and rodents. Some of them, like *Orohippus,* pointed toward modern families; others, such as *Palaeosyops,* belonged to wholly extinct groups. Thus, Osborn and Scott, together with several of their classmates, made their entry into a world of powerful enchantment, a world which laid such a spell upon them that they were inspired to go back to it again and again.

We find Osborn leading a second Princeton expedition to Wyoming in the following summer (1878) and, in company with Messrs. McMaster, Scott, Speir, McCosh and Annin, exploring the Upper Eocene beds of the Washakie Basin. Here they discovered much valuable material of Professor Cope's *Loxolophodon* and allied genera. These strange beasts had feet like those of elephants but long narrow skulls surmounted by three pairs of blunt horns. They had great sabre-like upper canine teeth and their cheek teeth bore oblique cross-crests adapted for cutting coarse vegetation.

Other important fossils were discovered which were also described later by Osborn [3] and Scott and Osborn. On this expedition the explorers paid more particular attention to the stratigraphic sequence of the Eocene formations of Wyoming and to the problems involved in determining and correlating the corresponding formations in different areas.

Thus we suspect that the mysterious "impulse" and "call" to a life of research which Professor Osborn envisioned in his later years may have been not a sudden "creative evolution" but a gradual summation of his own reasoned responses to favorable environmental stimuli and opportunities.

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[3] E.g., "A Memoir upon *Loxolophodon* and *Uintatherium.*" Contrib. E. M. Mus. Geol. and Archaeol., College of New Jersey, vol. I, no. 1, 1881.

See also Contrib. E. M. Mus. Geol. and Archaeol. Princeton College, Bull. No. 3, 1883.

Not yet, however, was Palaeontology a potent word in the curriculum of the College of New Jersey. Biology, on the other hand, was just beginning to acquire its magic. In short, Dr. McCosh, with his broad philosophy, saw that there was room for both Scott and Osborn in that department. They in turn had realized their own lack of adequate preparation in biology and their need of direct contact with the science that had been so recently rejuvenated by Darwin. What more natural than that they should plan a year of study in Europe? Meanwhile, in the winter of 1878 Osborn [4] took a special course of study in anatomy and histology in the College of Physicians and Surgeons and Bellevue Medical School of New York under Dr. William H. Welch, who later became famous at Johns Hopkins University.

In April, 1879, Osborn went to Cambridge University, England,[5] and there joined Scott in a three months' study of embryology under Francis Balfour. In the Morphological Laboratory at Cambridge, Balfour supervised the studies of the young Americans upon certain developmental stages of the common European newt.[6] This study must have been completed within a few months of its inception, for it was published in October of the same year. Taking the plans and descriptions followed on the one hand by Balfour in his account of the embryology of sharks, and on the other hand by Götte in his description of the development of the toad (*Bombinator igneus*), the authors dealt in a strictly comparative way with the segmentation and formation of the three germ layers, the origin of the notochord, the body cavity, somites of the head, etc. The plates were made from drawings by the authors.

The summer of 1879 Osborn spent in Germany [5] and the winter of 1879-80 in London, studying comparative anatomy at the Royal College of Science under Professor T. H. Huxley. This was in many ways a period of signal importance to his future career. From every one of his great teachers he derived inspiration, perspective, insight and method.

[4] "Fifty-two Years of Research, Observation and Publication," p. 153.
[5] "After Twenty Years": The Record of the Class of 1877, Princeton University, 1877-1897, p. 72. Trenton, N. J. 1898.
[6] Quar. Journ. Micros. Sci., vol. XIX, N. S. London, 1879.

While his Princeton and home connections gave him an introduction into the best social and university circles, he and his partner Scott were likewise welcomed as young explorers of the fossil treasures of western North America. And we can well imagine how deeply the sensitive young Osborn must have been moved when Professor Huxley, conducting Charles Darwin through the laboratory of comparative anatomy in London, stopped and presented the young American to that incomparably great and gentle man. On this and succeeding periods in England he not only formed friendships of great value, with Professor Huxley, with Francis Galton, Edward B. Poulton, Leonard Darwin, and many others, but also acquired an abiding interest in the grand problems of evolution.

Returning to Princeton in the autumn of 1880, Osborn [7] was appointed to a special Biological Fellowship. In 1881 he received the degree of Sc.D. and was made Lecturer in Biology, then Assistant Professor and finally Professor of Comparative Anatomy.

During the twelve years of his service at Princeton his scientific publications, which were few and small in comparison with those of his later years, dealt mostly with topics in mammalian palaeontology, in comparative neurology and in certain limited studies of the "mind's chamber of imagery," due to connections with Dr. McCosh.

In the earlier years he frequently read papers at the Science Club at Princeton, some of which are preserved [8] in manuscript form. One of them is a brief unpublished account of a journey that he made shortly after his return from England to the coastal lands of Texas and Louisiana to collect materials for his and Scott's studies on the development of the Amphibia and Reptilia and for his own studies on the evolution of the brain. The country over which he travelled on horseback and by coach abounded in interest to the young naturalist: here ancient amphibians lived and bred, alligators laid their eggs, covered them in mounds and left diverse footprints on the muddy banks; here ganoid fishes of vast antiquity left their scales and bones in the

[7] "After Twenty Years": The Record of the Class of 1877.

[8] In the Osborn Library of the American Museum of Natural History, New York.

mud; here, in short, the story of past ages was being reenacted before his eyes.

Nevertheless he seems to have regarded this journey as unsuccessful. "Balfour's inspiration in embryology," he tells us,[9] "led to unsuccessful journeys and attempts in the southern United States to secure the embryonic history of two very characteristic American types, namely, the alligator and the giant long-tailed amphibians *Amphiuma* and *Menopoma*—unsuccessful because I had not the aptitude of the field naturalist in collecting these eggs and embryos nor a talent in embryological technique. It is well to realize one's inaptitudes, so that one may the better advance in the direction in which his talent does lie. *If you cannot find your research way in one direction turn to another in which you may be successful.*"

Whether or not he was justified in being discouraged and in believing that he "had not the aptitude of the field naturalist in collecting these eggs and embryos nor a talent in embryological technique," this state of mind may have disposed him to withdraw from comparative embryology and devote more time to fossil mammals; the latter by 1888 had practically crowded out his further work in the former field.

Here again we see in his history no signs of "predestination," hereditary or otherwise, but chiefly a wise opportunism and adaptability, a realization of his limitations in certain directions and a growing copiousness of production along the lines which suited him best.

By the time Osborn returned from England, after his contacts with Balfour and Huxley, he had a perfectly clear field of major interest, which was the study of evolution from as many angles as possible. Accordingly he pushed forward his studies on the foetal membranes of the opossum and other marsupials (1883, 1887) and upon the structure and evolution of the brain in amphibians (1883-1886). He was never content merely to describe facts but sought always for results of general interest. In this connection, in his autobiographic sketch (p. 63) he writes as follows:

"In every field of nature direct observation with accumulation

[9] "Fifty-two Years of Research, Observation and Publication," p. 65.

of facts is a fascinating pursuit. Many most useful and even eminent naturalists spend their entire lives in this way; they are the 'drawers of water and hewers of wood' for others. It is not that they lack powers of generalization but that they apparently take no interest in generalization for the drawing of inductions. Sometimes important discoveries are made in this methodical way but more often discovery of new principles emerges from generalization. In any event, the *discovery of new principles is the chief end of research.* As Darwin observed, the true naturalist is not content with merely assembling facts; his chief desire is to seek interpretations and explanations —in other words, to discover new principles.

"I have myself always found the mere assemblage of facts an extremely painful and self-denying process and I have always been animated by the hope that such dry work would finally be rewarded by an interpretation or the discovery of a new principle."

In the same revealing source book (p. 65) he sums up his work on the internal structure of the amphibian brain in the following passage:

". . . From personal experience also I discovered a very important principle in the internal structure of the amphibian brain (1888), namely, *the subdivision of the cranial nerves into many separate physiological components,* which in these very small brains could be traced with great distinctness, so that the older classification of the cranial nerves could be amplified by the newer classification based upon the many separate components.

"This near vista awaited the masterly patience and technique of one of my students, Oliver S. Strong, now Professor of Neurology in Columbia University, in a classic memoir on the brain of the frog, in which all the components of the cranial nerves were skillfully traced. A similar classic on the brain of the fish was also prepared by C. Judson Herrick, of the University of Chicago, under Strong's direction. My ten-year experience in comparative anatomy and neurology thus gave me the privilege of initiating a new school of neurological research in America, in which I myself saw the Promised Land in the

distance, although my technical disability and preoccupation with other interests precluded my attaining it."

His search for the origin of the mammalian corpus callosum led him to conclude (1886) that this structure was already foreshadowed in the brains of amphibians, but later neurologists [10] were able to prove that the corpus callosum arose only in the mammals above the grade of the monotremes.

In his work on the embryonic membranes of the opossum, "Osborn's only serious error seems to have been his identification of actual 'villi' on the outer surface of the chorion (subzonal membrane) in the region where the yolk-sac comes into apposition to its inner surface. These 'villi' have not been observed by any one else, and it seems almost certain that they were mere blister-like artifacts. In Osborn's 1883 paper he does not speak of these villi as already vascular but conjectures that they later become so. (He was misunderstood on the point by Haddon in his *Introduction to Embryology,* 1887.) The material on which Osborn's 1883 paper was based was very limited; only one pregnant opossum, and one horn of the uterus with the contained embryos was accidentally lost. His observations on the vascularity of the yolk-sac and his suggestion of its importance as the chief organ of nutrition during intrauterine life of the embryos are highly important, and he speaks of the structures as 'yolk-sac placentae'" (J. H. McGregor).

"Osborn thought, apparently erroneously, that the *cavity* of the yolk-sac in *Didelphys,* between the inner vascular surface and the outer non-vascular surface, became obliterated. This is certainly not the case in other marsupials" (J. H. McGregor).

Continuing his fruitful partnership with Scott, he published several papers (1882-1887) on Eocene ungulates, culminating in the account (1887) of the fossil mammals of the White River formation. In this paper the authors briefly described several new species of certain giant extinct ungulates that were allied with Dr. Leidy's *Titanotherium,* Cope's *Symborodon* and Marsh's *Brontotherium.* At this time doubtless Osborn began to be interested in the confusing taxonomic problem of this strange family (afterward referred to as the "titanotheres"),

[10] Elliot Smith and others.

which was to occupy so many years of research at a later period.

In 1886 Osborn made an extended visit in England in order to study the remains of Mesozoic mammals, chiefly in the British Museum. These remains consisted almost wholly of numerous broken jaws and teeth. The smallest of these animals were no bigger than mice, the largest scarcely as big as kittens. They had been monographed many years before by Sir Richard Owen and catalogued and revised by Lydekker. Moreover, Professor Marsh had recently published a paper describing corresponding forms from the dinosaur-bearing beds of Jurassic age in Wyoming. Nevertheless the young American, somewhat rashly perhaps, made his own independent studies on the originals and the results,[11] imperfect as they undoubtedly were, fully justified his efforts. For in the first place it was well that these oldest known relics of the mammalian class should be so carefully restudied by a young mind and from the evolutionary viewpoint; and although, as Osborn recognized, the fossil record was still too imperfect to give final answers, yet the fragments did establish the facts that at a period as far back as the lower Jurassic the multituberculate mammals were already an ancient and highly specialized side branch, while the remaining families were diversely specialized away from a still more ancient primitive insectivorous type; also that some of them seemed to be more nearly related to the stem of the marsupials, others to the earliest insectivores of the placental series.

Secondly, Osborn's work on the Mesozoic mammals appeared to him to have brought considerable support to Professor Cope's view of the way in which the "tritubercular" type of molar tooth seen in many of the Lower Eocene mammals had in its turn arisen from the single-tipped molars of the Upper Triassic *Dromatherium*.

After studying the teeth of these oldest known true mammals, the contemporaries of the older Jurassic dinosaurs, Osborn went on to develop and apply Cope's theory in a series of papers dealing with the "Evolution of Mammalian Molar Teeth to and from the Triangular Type," which were eventually (1907) brought

[11] "The Structure and Classification of the Mesozoic Mammalia." Journ. Acad. Nat. Sci. Philadelphia, vol. IX, no. 2. 1888.

together in the well known book of that title. Thus he became the founder with Cope of what is commonly called the "Cope-Osborn theory of Tritubercuły," which has been of incalculable value to vertebrate palaeontologists, since it placed in their hands what Osborn called a key to the complexities of the highly diversified patterns of the molar teeth of mammals. Osborn's fruitful labors in this field must here be dismissed with the foregoing lines but they have been elsewhere summarized by the present writer.[12]

For many years prior to Osborn's work on Mesozoic mammals Cope and Marsh had been engaged in their strenuous rivalry and struggle for prior discovery and publication of the fossil vertebrates of the West. Osborn and Scott even in their first "Palaeontological Report of the Princeton Scientific Expedition" were almost inevitably ranged on the side of Cope, from whom they received much encouragement and practical assistance. For example, after describing the skull and dentition of their supposedly new genus and species, *"Leurocephalus cultridens,"* they write (p. 48): "This may eventually prove to be a species of *Telmatherium* (Marsh); but the description given by him is so brief and uncharacteristic that it might apply to any of the allied genera. Indeed, Dr. Leidy has regarded it as a synonym of *Palaeosyops*." Again, in his first independent memoir, that on *Loxolophodon* and *Uintatherium* (1881), Osborn implied that Marsh followed Leidy in the exploration of the Bridger beds, a statement which was flatly contradicted by Marsh in his memoir on the Dinocerata (1886, p. 236).

Whatever may have been the merits of the original controversy, it seems to have led, at least indirectly, to a serious clash between Osborn and Marsh over the Mesozoic mammals. Osborn in 1891 published a critique of Professor Marsh's "Discovery of the Cretaceous Mammalia," in which he tried to show that Marsh had applied a great many generic and specific names to the isolated parts of the highly differentiated dentition of a single type of multituberculate. Marsh replied ("Note on

[12] "A Half Century of Tritubercuły: The Cope-Osborn Theory of Dental Evolution." Proc. Amer. Philos. Soc., Vol. LXXIII, No. 4, April, 1934, pp. 169-317 [Osborn's theory and diagrams, 181-186].

Mesozoic Mammalia") with a vitriolic review of Osborn's monograph on the Mesozoic Mammalia, to which Osborn in turn (1891) very soon came back with a vigorous rejoinder. A careful reading of the documents impresses the present writer that Osborn more than held his own in this affair and that he revealed himself as by no means unwilling to defend his right.

After Osborn's vitalizing contact with the English leaders in evolution it is not surprising that he retained an abiding interest in all the larger questions of evolution, such as the relations between natural selection and the Lamarckian factor of use and disuse. It was not until 1889, however, that he began a long series of communications in this field with his paper on "The Palaeontological Evidence for the Transmission of Acquired Characters." The series was continued at intervals to the close of his life. It is so intertwined with more limited subjects that one finds difficulty in separating the titles of his papers that deal with the factors of evolution from those treating of the historical evidences of the process. Thus he himself (1930, pp. 101-106) lists no less than eighty-five titles under the head of "Biology and New Principles of Evolution," after excluding all those that dealt with the evolution of man and with "Evolution and Religion in Education." However, many of the entries on his list are secondary sources, such as reviews or accounts of his addresses, interviews and popular articles in the daily press, and the like. Nevertheless, after all necessary deductions have been made, his publications on the general principles of evolution reach a formidable total. His main conclusions on the ways of evolution are summarized below (p. 82).

AT COLUMBIA UNIVERSITY

From 1873, when the young Osborn entered Princeton, to 1891, he was in residence there except for brief periods abroad. He was married [13] on September 29, 1881, to Miss Lucretia Thatcher Perry, daughter of General Alexander J. Perry, U. S. A., and was the father of five children. He had a delightful home in Princeton and every prospect of remaining

[13] "After Twenty Years . . . ," p. 74.

peacefully there as Professor of Comparative Anatomy and free to follow his own bent in palaeontology for the rest of his life. Then, when he was only thirty-four years of age, came the call to Columbia (1891) and the simultaneous call to the American Museum of Natural History. To Columbia,[14] at that time in the early stages of its transformation from a small college to a great university, he was called by President Seth Low in order to plan, establish and head the new department of biology. To the American Museum [15] he was called by President Morris K. Jesup to found and guide a department of mammalian palaeontology. Perhaps no one now living knows the exact steps by which these two calls were so completely synchronized and integrated but the twofold relationship proved to be most fortunate and far reaching.

At Columbia the legacy of Charles M. Da Costa made it possible to develop the new department of biology upon a liberal scale. The department was organized under Professor Osborn's direction in 1891,[16] but it was not opened until 1892. Professor Osborn was made Da Costa professor of zoology; Professor Edmund B. Wilson was called from Bryn Mawr for invertebrate zoology; Dr. Bashford Dean of Columbia University, who had been associated with Professor John Strong Newberry in the study of Palaeozoic fishes, was made instructor in vertebrate zoology. For the first six years the department was carried on in a laboratory at the College of Physicians and Surgeons.

Early in 1892 Professor Osborn delivered a series of three lectures on "Present Problems in Evolution and Heredity." These were addressed to the alumni of the College of Physicians and Surgeons. They constitute an admirable summary and analysis of current literature bearing on the following, among other topics: the meaning of "anomalies" and "reversions" in human anatomy, the relations of development, balance and

[14] "A History of Columbia University," 1754-1904. . . . New York, 1904, pp. 155-156.

[15] The American Museum of Natural History . . . : Annual Report of the Trustees. . . . Twenty-third Annual Report of the President, 1891. New York, 1892, p. 10.

[16] "Zoology at Columbia." Columbia University Bulletin, December, 1897.

degeneration, chiefly in human bones and muscles; history of the heredity theory, contrasting claims of Lamarckian and Weismannian schools; factors of evolution, difficulties in the natural-selection and use-and-disuse theories; nature of the relations between the body cells and the germ cells; phenomena of cell division, including distribution of the chromatin substance to the tissues; nature of fertilization, and the like. These topics were destined to be dealt with later in great detail by others in Professor Osborn's new department and it was characteristic of him that he undertook the great labor of preparing such a series and that he was measurably successful in correlating so many specialities in a broad, comprehensive, and at the same time well documented presentation.

The breadth of scope of Professor Osborn's lectures at Columbia, together with his excellent blackboard drawings, aroused the enthusiastic appreciation of both undergraduate and graduate students. He was soon elected the first Dean of the Faculty of Pure Science in Columbia University, which position he held for three years.[17] In the meantime he had supervised several scientific expeditions by members and graduate students of the department and had instituted the Columbia University Biological Series of books, outlining its scope and editing it for several years. Volume I of the series, his own "From the Greeks to Darwin: An Outline of the Development of the Evolutionary Idea," was based on a series of lectures which he had delivered on this subject. In it he traced the history of the idea of evolution from its more or less obscure adumbrations among the Greek philosophers and the fathers of the Church to the more immediate predecessors and contemporaries of Darwin. With regard to the place of Aristotle in the history of the discovery of evolution, Osborn concluded (p. 57) that "Aristotle had substantially the modern conception of the evolution of life from a primordial soft mass of living matter to the most perfect forms, and that even in these he believed evolution was incomplete for they were progressing to higher forms." This interpretation of Aristotle's views has, however, been

[17] "Fifty-two Years of Research . . . ," p. 153.

shown to be incorrect by Harry Beal Torrey and Frances Felin,[18] for although Aristotle recognized the existence of intermediates, for example, the ascidians, as supposedly partaking of the nature of both plants and animals, yet he was a firm believer in the Platonic doctrine of eternal "forms," including what are now called organic species. Osborn, in short, put together Aristotle's recognition of individual development and of gradational characters between otherwise distinct forms and then imputed to Aristotle a belief in phylogenetic progression.

While Columbia was preparing to remove to its new site at Morningside Heights, Professor Osborn and his colleagues in the department of biology spent a great deal of time and effort in planning the new laboratories, library and offices of the department, which were to be located in the Natural Science building presented by William C. Schermerhorn. All this was successfully done; Professor Osborn delivered an address, "The Corner Stones of Learning," on the occasion of the dedication of the new site at Morningside Heights on May 2, 1896, and supervised the installation of the department in its new home in 1897.[19]

Under his leadership a number of important contributions were made to various broad problems of evolution in which he was particularly interested. Dr. Oliver S. Strong published a detailed analysis of the brain and cranial nerves of the frog. Dr. Arthur Willey prepared a valuable work on "*Amphioxus* and the Ancestry of the Vertebrates." Dr. Bashford Dean produced his remarkable textbook on "Fishes, Living and Fossil" and his colleague Dr. Edmund B. Wilson published his great work on the Cell.

Osborn continued to give regular lectures in his Columbia courses on the Evolution of the Vertebrates and on the Evolution of the Mammals until about 1907, but gradually, owing to increasing pressure of other work, he handed over his courses to the present writer, who was for many years his assistant at both Columbia University and the American Museum. Mean-

[18] "Was Aristotle an Evolutionist?" Harry Beal Torrey and Frances Felin in Quarterly Review of Biology, Vol. 12, No. 1, March, 1937, pp. 1-18.

[19] "Zoology at Columbia," Columbia Bull., December, 1897.

time his graduate courses had been transferred to the department of vertebrate palaeontology at the Museum in furtherance of a plan adopted by both institutions for close coöperation in this matter. Osborn was made research professor of vertebrate palaeontology at Columbia but generously arranged for the reversion of his salary to the department of zoology there.

AT THE AMERICAN MUSEUM OF NATURAL HISTORY

A. As Curator

Returning to the other main stream of Professor Osborn's activities, we find him losing no time in organizing his department of mammalian palaeontology at the Museum, which opened in May, 1891, and in sending an expedition to the Lower Eocene beds of Wyoming. His first assistant was Dr. J. L. Wortman, one of Cope's former collectors, a man well trained in human anatomy, in field geology and in the technique of taking out fossils from their stony beds. Osborn's second assistant was Charles Earle, one of his graduate students at Princeton, who was then busy on a memoir on the genus *Palaeosyops* and its allies. Another assistant was Mr. O. A. Peterson, who eventually became curator of palaeontology in the Carnegie Museum of Pittsburgh.

The first expedition of the department was highly successful in the discovery of fossil remains; the report on these by Osborn and Wortman in 1892 deals with: the "homologies and nomenclature of the mammalian molar cusps (H. F. O.), the classification of the Perissodactyla (H. F. O.), the ancestry of the Felidae (J. L. W.), the taxonomy and morphology of the Primates, Creodonts and Ungulates (H. F. O.), geological and geographical sketch of the Big Horn Basin (J. L. W.), and Narrative of the Expedition of 1891 (J. L. W.)," each under the individual author's initials. Here we see Osborn, who had collaborated so harmoniously with Scott but had been forced by his removal from Princeton to dissolve that partnership, continuing this general policy of partnership, first with Wortman, then with Earle, later with Matthew and with many others, to

whom he never failed to give generous acknowledgment as well as access to priceless material.

To return to the first report on the collection of Lower Eocene mammals, the joy of discovery shines on almost every page and the cautious following of the elders which was evident in the early palaeontological papers has now given place to confidence based on previous triumphs. One is tempted to comment on many of the ideas in this and succeeding palaeontological reports in the American Museum Bulletins but there is space for only the following item. After describing the construction of the fore foot in the oldest known species of *Palaeosyops,* Osborn writes: "In short, this foot is distinctly mesaxonic and functionally tridactyl, whereas the later forms from the Bridger are, so far as known, paraxonic and functionally tetradactyl; in other words, we find an early species with a more progressive and modified form of foot than the later species, a state of affairs which is decidedly inconvenient for the evolutionist." It remained for Dr. W. D. Matthew, one of Osborn's graduate students at Columbia, later Assistant Curator and eventually Curator in the Museum, to bring forward the palaeontologic evidence that as regards the evolution of the fore foot in perissodactyls, Cope, followed by Osborn, was looking at evolution through reversed mental glasses; that is, they had mistaken what was really the older and more primitive condition for an advanced specialization. Osborn himself was well aware of the human proneness to error and never took it badly when his assistants, whom he had chosen because of their originality, differed from him.

In 1895 the title of the department of mammalian palaeontology was changed to department of vertebrate palaeontology, as better defining the more inclusive character of its collections.* This year was notable for the purchase of Professor Cope's great collection of fossil mammals of North America, including nearly 10,000 specimens representing 483 species from the chief horizons of North America. For the gift of this collection the Museum was indebted not only to President Jesup and other

* Annual Report of the President for 1895, American Museum of Natural History, New York, 1896, p. 16.

trustees but to Professor Osborn's father, William Henry Osborn, as well as to Professor Osborn himself. Meanwhile, year after year, Museum expeditions continued to discover new fossil mammals in the Rocky Mountains and Great Plains.

The subsequent history of the department of vertebrate palaeontology under Osborn's leadership would require a volume in itself and even if we limit our attention to the chief works in which Osborn himself took a particularly active part, the list would be too long for more than passing comment. However, one may mention the following:

(1) The discovery of numerous dinosaur remains in the course of many Museum expeditions in the Rocky Mountains and in Alberta, chiefly under Barnum Brown; described in the memoirs and bulletins, by Osborn and his assistants, on *Diplodocus, Brontosaurus, Morosaurus, Tyrannosaurus, Ornitholestes, Struthiomimus,* and others.

(2) The studies on the ordinal classification of the reptiles by Osborn and McGregor, which resulted in the proposed subdivision of the entire class into two subclasses, Diapsida and Synapsida. This classification became the stimulus for many others by subsequent authors.

(3) Osborn's studies on the origin of the mammals from the mammal-like reptiles and on the origin of birds from the Permian ancestors of the dinosaurs, although not based on specimens originally described by him, were marked by insight and good sense and have not yet been superseded except in details.

(4) His studies on the classification and phylogeny of the fossil rhinoceroses of Europe and North America, leading to: (a) his recognition of the differences in the length-breadth proportion of the skulls (in "dolichocephalic, mesaticephalic and brachycephalic" types), and of the feet (in "dolicho-mesati- and brachypodal" types); (b) his use of these characters as diagnostic of numerous subfamilies; (c) his conclusion that, contrary to his earlier beliefs, the rhinoceroses were exceedingly "polyphyletic" during the greater part of the Tertiary period.

(5) His studies on the classification and evolution of the titanotheres, culminating in the great two-volume monograph on this family, which was completed in 1920 and published by the

United States Geological Survey in 1929. Here the principles used in the rhinoceros studies were further developed and the taxonomic results were made the basis for many conclusions regarding the ways in which evolution has taken place. The history of the family was followed in great detail from the later part of the lower Eocene through the middle and upper Eocene to the top of the lower Oligocene. The fossils show that during this time the race increased in size from animals that were about as large as racehounds to huge beasts rivalling the modern elephant in bulk, though not in height. Although divided into many parallel and divergent lines, all became extinct, at least in North America, by the close of lower Oligocene times.

In seeking answers to the question, "What may have caused the sudden extinction of this race?" Osborn searched the vast literature of extinction in animals and compiled over one hundred causes and conditions that may have contributed to the extinction of different kinds of herbivorous mammals. The extinction of the titanotheres he attributed in part to the fact that in them the evolution of the cheek teeth was far more retarded than in other perissodactyls and he supposed that they were crowded out by more efficient competitors.

(6) Osborn's continuous studies on the correlation of fossil mammal-bearing horizons of Europe and North America, which were begun in his earliest memoir (on *Loxolophodon,* 1881), together with his many publications on the fossil mammals of the Tertiary, supplied the basis for his textbook, "The Age of Mammals in Europe, Asia and North America" (1910), which, although compiled with the aid of several assistants, constitutes one of his greatest and most useful works.

(7) For many years Osborn supervised the work of assistants in compiling a vast deposit of excerpts from the scientific literature of the species and breeds of horses, asses and zebras. It was his intention to work this up into a monograph on the Equidae, living and fossil, but other interests, particularly the Roosevelt Memorial and the Proboscidea Monograph, prevented him from realizing this ambition; consequently a great part of the material he amassed still lies untouched. However, his efforts in this direction led to three important results:

(a) Mr. William C. Whitney provided funds for exploration and research by the aid of which the Museum's collection of fossil Equidae received many important accessions; Mr. J. W. Gidley, under Osborn's direction, secured among other valuable material a beautiful skeleton of *Neohipparion whitneyi.*

(b) Mr. Samuel Harmsted Chubb was engaged in 1901, and even at this writing (1937) is still engaged in preparing a superb series of mounted skeletons representing the principal species and breeds of horses, asses and zebras and illustrating characteristic postures and movements of the animals in life; at the same time a great study collection of recent Equidae skeletons and dentitions has been built up.

(c) At Professor Osborn's request, Dr. W. D. Matthew prepared the first draft for a revision of the fossil Equidae of the Oligocene, Miocene and Pliocene of North America, accompanied by an extensive series of excellent illustrations. This was intended to have been a joint work by Osborn and Matthew but the latter adhered firmly to the so-called "horizontal" or zonal system of defining and classifying genera, whereas Osborn was an enthusiastic exponent of his own "phylogenetic" or vertical method of putting remote ancestor and descendants in the same "genus." This difference finally resulted in a deadlock, in which Matthew withdrew from the work and refused to collaborate with Osborn. At the same time, however, he handed over all his manuscript and had no objection to Osborn's using it as he saw fit, but he refused to allow his name to be used as co-author of the published work. In this awkward situation Osborn made the following frank and generous acknowledgment in the preface to the memoir.

"The author is chiefly indebted to the original researches by Matthew mentioned above (Matthew, 1913) on the Miocene and Pliocene species of Equidae in the collections of the American Museum of Natural History. At first a joint report was contemplated; but for certain reasons it has appeared wiser that the present revision should appear under a single name. The author issues it, therefore, with the fullest acknowledgment of his indebtedness to his colleague, from whose descriptions, observations, and definitions many quotations are taken entire

without amendment. On certain points of difference of interpretation and opinion which have arisen the author holds himself wholly responsible."

In spite of these regrettable but sincere differences the memoir contains superb material for the study of evolution.

(8) Osborn's studies for "The Age of Mammals" naturally led him to plan a corresponding volume on the Age of Man. In 1912 a rapid motor tour through those parts of Europe that contain the principal sites of the Palaeolithic cultures gave him a general introduction to the subject and three years later appeared his "Men of the Old Stone Age, Their Environment, Life and Art." He was assisted in this work by Miss Christina D. Matthew. The text was illustrated from photographs of the carefully studied reconstructions by Professor J. H. McGregor of the skulls and external features of the head of *Pithecanthropus* and of the Neanderthal and Cro-Magnon men. Further studies, on the correlation of the divisions of the Pleistocene of Europe and North America, were made with the collaboration of Dr. Chester A. Reeds.

"Man Rises to Parnassus" is chiefly based on the studies of Montelius and others on the Neolithic, bronze and iron cultures of Northern Europe, which Osborn also visited.

(9) Osborn's growing conviction of the great antiquity of many "phyla" of mammals gradually led him to the view that the human race had an equally long independent ancestry stretching back perhaps into Eocene times before merging in a common stock with the remote ancestors of the anthropoid apes. Partly for this reason he refused to assent to the theory that man's ancestor had ever been an ape. Vigorously attacking the "ape-man theory" as a "myth," he wrote enthusiastically that humanity should be grateful to the anthropologist for having freed man from the bar sinister of ape ancestry. Against these and similar utterances the present writer felt compelled to enter a vigorous demurrer and on several occasions Osborn and the writer presented these opposing views from the same platform. It was greatly to Osborn's credit that he refrained from using his power to silence his former assistant and that he always treated the latter not only with perfect fairness but with unfail-

ing friendship, so that to the day of his death there was never a cloud between them.

(10) Osborn's last and in many respects his greatest work was the monograph on the Proboscidea, projected in 1908 but not fairly begun as a monograph until 1920. The first volume, including 802 pages and 680 figures and 12 plates, was published on August 15, 1936, nine months after his death; the second volume, which will appear in 1939, will be of about the same size. The main results are that the order Proboscidea is divided into five superfamilies, eight families, twenty-one subfamilies, forty-four genera and about three hundred and fifty species, including subspecies and varieties, mostly on differences in the molar teeth, incisor tusks, jaws and form of skull. This was perhaps the climax of "polyphyletism."

(11) By no means the least of Osborn's gifts to the Museum was the Osborn Library of Vertebrate Palaeontology, including at the time of his death about 8,000 bound volumes, several thousands of "separata," together with a subject index of possibly 70,000 entries.

B. As President

The annual reports of the President of the Board of Trustees of the American Museum of Natural History from 1908 until 1933 contain a great deal of material relative both to the growth of the Museum and to the ideals which guided that growth during the presidency of Henry Fairfield Osborn. One reads there how, one after another, the new wings that had been planned during Mr. Morris K. Jesup's presidency (namely, all those on West 77th Street and the southwest wing on Columbus Avenue) were completed, and how the exhibition halls therein were opened one by one. And one also reads of the buildings planned under Professor Osborn's presidency, including the buildings along Central Park West, together with the African Wing, the Education Building, the Preparation and Power Building, the Roosevelt Memorial, built by the State of New York; one after another these were completed and connected with the general system. And in a special publication on the plan and scope of the Museum are set forth Osborn's plans for the future development and completion of the entire Museum. But in these publi-

cations the reader receives hardly a hint of the *vis-a-tergo* that was constantly being exerted by President Osborn upon the Museum Trustees and the city and state officials by whom the necessary enactments and appropriations were in every case to be approved and put into effect.

Nor does the reader easily derive from these somewhat formal reports such a vital portrait of Henry Fairfield Osborn, President of the Museum, as was presented the day after his death by Dr. George H. Sherwood, Director of the Museum during the greater part of Professor Osborn's presidency.

"Professor Osborn has left behind him a splendid record of service to the American Museum, covering a period of more than forty years. He was our president for a full quarter of a century, an epoch in the Museum's history which witnessed unprecedented development in all its branches—physical, financial, scientific, and educational. Under his leadership and direction the building space was more than doubled; the city's annual appropriation for maintenance increased from approximately $160,000 to the half million mark; the endowment, the backbone of the Museum's life, multiplied from $2,000,000 to more than $14,000,000; the Museum membership increased over 400 per cent; the scientific staff was more than trebled; the earth was dotted with our expeditions; collections of priceless value were brought within our walls; volumes of publications, scientific and popular, were issued and given world-wide distribution; the artistic standard and effectiveness of Museum exhibitions was vastly improved; while the popular presentation of natural history and kindred subjects was made so appealing that many technical scientific terms became household words.

"Throughout President Osborn's administration it was my privilege and good fortune to stand at his elbow. In this long association, therefore, I had exceptional opportunity to observe, feel, and *know* his character and personality. Words of mine would be wholly inadequate to summarize his achievements or evaluate his contributions to human knowledge. Therefore I wish to speak merely of a few of his characteristics which were outstanding and have left on us a vivid impression of a great man.

"Notable was his *breadth of vision.* While his special science was palaeontology, it was the Museum as a whole that was of paramount importance, and every department had his genuine interest. Always was he keen for developments which would make our institution a greater power in science and education. For example, I well remember his enthusiasm when he first learned of the wonderful instrument called the Zeiss Planetarium. It was only a few weeks later that he dispatched Doctor Fisher to Germany to bring back first-hand information of it.

"Next I have in mind his *tenacity of purpose.* Here was a man born to wealth who might have led a life of luxury and ease. Instead, he set out with the determination to make his mark in the field of science—and he did. This same tenacity of purpose he applied to the administration of the Museum. Obstacles did not deter him. They were there to be overcome and he forged ahead. When he was sure he was right, no one, not even his most intimate friends, could swerve him from what he felt was his path of duty.

"Third I place his *fertility of mind*—and what fertility it was! He could think of enough things that ought and must be done to keep a regiment of us busy. Oftentimes I wished his mind weren't quite so fertile and that we might have time to catch up with his ideas or complete some of the problems on hand. Still it was this fertility of mind that kept us on our toes and urged us on to achievement.

"Another outstanding characteristic was his *sympathy with youth.* He had an affectionate regard for all children and nothing gave him so much pleasure as to see the classes of school children streaming into the Museum. . . .

"Finally I mention the Professor's *eternal optimism.* He had a philosophy of life which carried him over discouragements that would have floored a less virile nature. Again and again I have seen him up against difficulties that were simply overwhelming, and invariably he would come up with a smile on his face. And so I feel that if he were here today he would not want us to consider this a time for sorrow or sadness at the loss of a dear friend, but rather would wish us to reflect on the

achievements of his administration and do our best to carry on his ideals."

Osborn's presidency was important to the Museum also because he constantly insisted on very high standards of beauty in the mounted groups, in mural paintings and other decorative features of the exhibition halls.

HIS LEADERSHIP IN OTHER SCIENTIFIC AND EDUCATIONAL ORGANIZATIONS

Professor Osborn's brilliant successes at Columbia University and the American Museum encouraged other scientific and educational organizations to look to him for leadership. The American Society of Naturalists started the ball rolling in 1891 by electing him as its President.[20] The next year the American Association for the Advancement of Science made him one of its Vice Presidents. The New York Academy of Sciences, the New York Zoological Society, the Marine Biological Association of American Colleges, the American Morphological Society and later organizations, elected him at different times to their presidencies. And a greater presidency overtook him in 1908 when he succeeded Mr. Morris K. Jesup as the head of the American Museum.

Soon after coming to New York he began to take an active part in the meetings of the New York Academy of Sciences, presenting there many of his palaeontological results and serving in 1894-96 as Vice President and in 1898-1900 as President of the Academy. He was especially influential in bringing about the permanent affiliation of the Academy with the Museum and the eventual transfer of the Academy itself to the Museum buildings. His two annual addresses as President of the Academy in 1899 and 1900 dealt extensively with "Correlation between Tertiary Mammal Horizons of Europe and America." In the first address he analyzed the evidences of parallelism between the successive horizons of Tertiary mammals on opposite sides of the Atlantic. In the second address he dealt espe-

[20] "After Twenty Years . . . ," p. 73.

cially with the faunal succession and geographical distribution of the orders and families of mammals on the different continents. This led to his "theory of successive invasions of an African fauna into Europe"; this was that the Ethiopian region [in the broad sense] or South Africa was a great center of independent evolution for the "Proboscidea, Hyracoidea, certain Edentata, the antelopes, the giraffes, the hippopotami, the most specialized ruminants, and among the rodents, the anomalures, dormice and jerboas, among monkeys, the baboons. . . ." These, he suggested, "may all have enjoyed their original adaptive radiation in Africa. . . ."

"On the other hand," he concludes, "certain families had an exclusively Eurasiatic history, so far as we know." These are, among others, "the anthropoid apes. . . ." Again in another passage: "Northern Asia is unknown palaeontologically until the Pleistocene—here is a region for explorers. However, we may consider it as part of a broad Eurasiatic land area—extending from the Rocky Mountain region to Great Britain. The faunal relations are astonishingly close, between the new and old worlds at this time. Every year's discovery increases the resemblance and diminishes the differences between Europe and the Rocky Mountain region."

The next year (1901) Charles W. Andrews of the British Museum began to announce the palaeontological discoveries that were being made in the Fayûm district in Egypt, which proved that at least two early stages in the evolution of the Proboscidea had indeed lived in Africa. The verification of the "prophecy" that northern Asia would be proved to have been part of a broad Eurasiatic land mass, containing important evidence of the faunal interchange between Asia and North America, had to wait until 1922-30, when Roy C. Andrews, another of Professor Osborn's assistants, opened up the great "Lost World" of the Gobi desert.

Professor Osborn was one of the charter members of the New York Zoological Society (1895). In 1896 he presented a joint report, with C. Grant La Farge and Andrew H. Green, embodying a "Preliminary Plan for the Prosecution of the

Work of the Zoological Society." He was chairman of the executive committee from 1896-1903, 1907-1909, President from 1909-1924 and Honorary President from 1927 until his death.

He had a great deal to do with the selection of the site of the Society's Park and with the planning and general style of its buildings and grounds. He was particularly interested in the development of the collection of living proboscideans, perissodactyls and other ungulates. With Mrs. Osborn's unfailing assistance, he was successful in enhancing the social prestige of membership in the Society and attracted many of the leading families of New York to its support.

He gave powerful aid to the Director, Dr. W. T. Hornaday, in the latter's sustained agitation for the protection of native wild life. As Honorary President of the American Bison Society, he assisted Dr. Hornaday in rescuing that species from the extinction with which it was threatened. Ably seconding his friends Madison Grant and John C. Merriam, he was one of the founders of the "Save the Redwoods League," which was finally successful in having certain sequoia-bearing areas set aside as permanent sanctuaries for those noble monuments of long past ages.

Always impartially supporting the researches and expeditions of all members of the staff, he was nevertheless particularly interested in the numerous expeditions and researches of Dr. William Beebe, in the publication of the latter's great monograph on the Pheasants, in the establishment of the Department of Tropical Research, and in the *Arcturus* expedition to the Sargasso Sea and the Galapagos Islands.

To Professor Osborn the animals of the Zoological Society's Park were by no means to be regarded as captives, brought together merely for the amusement of the public. They were, on the contrary, the ambassadors and representatives of the noble races that ruled the world during the Age of Mammals.

Osborn was also active in the American Philosophical Society and the National Academy of Sciences, attending many of the regular meetings and serving on various committees.

SUMMARY OF OSBORN'S VIEWS ON EVOLUTION

The present writer has elsewhere [21] summarized Osborn's chief ideas on the theory of evolution as follows:

(1) The law of *continental and local adaptive radiation;*

(2) The law of *homoplasy* or parallel but independent evolution in related lines of descent;

(3) The law of *tetraplasy,* whereby evolution results not from the operation of single causes, but as the resultant of forces from four principal directions (external environment, internal environment, heredity, selection).

(4) The law of *alloiometry,* or adaptive modification of dimensions of the skull, feet or other parts, arising independently in different lines of descent.

(5) The law of *rectigradation,* or *aristogenesis;* i. e., the gradual appearance during long ages of new structural units of adaptive value, predetermined in the germ plasm and in their initial stages independent of natural selection;

(6) The law of *polyphyly;* i. e., the normal occurrence of many related lines of descent, derived eventually from a common stock, but coexisting throughout great periods of time.

Osborn himself was under no delusion as to the lack of enthusiasm with which his writings on the theory of evolution were received in many quarters. In his autobiography he writes (p. 73):

". . . . it is important to warn the investigator that the assemblage of new facts and observations and what may be called the first line of conclusions or generalizations drawn from these observations makes much more rapid headway in science than the contemporary or final assemblage of new principles. In my own experience, the *facts and observations* I have assembled, with the aid of my colleagues, have gained world-wide acceptance and the subject of vertebrate palaeontology, with the contemporary work of other investigators along the same lines as my own, has become a matter of widespread knowledge and interest, whereas a half-century ago it reached only the scientific and cultured classes. . . .

[21] Science, Nov. 15, 1935, Vol. 82, No. 2133, pp. 452-454.

"The inductive line of investigation for the *new biologic principles* gained by extensive-intensive research advances much more slowly because it has to meet and contend with other principles strongly entrenched in the minds of observers in different fields of biologic research. . . .

"The new principles which I have enunciated from fifty-two years of palaeontological research—of Continuity, of Adaptive Rectigradation, of Allometrons—as well as the theory of Tetraplasy and Tetrakinesis, *have, so far as I know, gained no acceptance in the current realm of either biologic or palaeontologic thought.* The environmental principle of Adaptive Radiation, of polyphylogenetic evolution and of harmonic classification has, on the other hand, gained wide acceptance among palaeontologists and some measure of acceptance among zoologists.

"One need not be impatient; *if new principles are sound they will finally gain universal acceptance; if unsound, the less widely they are accepted the better.*"

RETROSPECT

In the midst of his diverse administrative labors Osborn found time to produce an enormous amount of manuscript for the printers, ranging over a wide variety of subjects. With the assistance of Miss Jannette M. Lucas and Miss Ruth Tyler, a critical examination of the nine hundred and forty-four entries in his complete bibliography was undertaken, with a view of measuring the size of his output in the six successive decades of his productive career. After careful consideration, corrections were made for the work of collaborators and assistants, for bibliographies and other clerical matter. Even with all these deductions he was the author of some 11,464 printed pages, not counting the still unpublished Volume II of the Proboscidea monograph, which would bring the total up to well over 12,000.

The net total outputs for the successive periods were as follows:

Periods	1878-88	1889-98	1899-08	1909-18	1919-28	1929-38
Net total pages.....	397	1,391	1,188	2,695	3,232	3,197 est.

Grand total 12,100.

These figures should, of course, be used with caution, since they show primarily not when the material listed was produced but when it was published. For example, by far the greater part of the copy for the great two-volume memoir on the Proboscidea was prepared by him before 1931, but owing to inevitable delays the work was not published until several years after his death. Moreover, a page containing an analysis of the phyla of the Mastodontidae cost the author far more time and effort than did a dictated page of the president's annual report.

Turning to the relative abundance of different subjects in successive periods, we have the following comparison expressed in net number of pages published, omitting miscellaneous matter, newspaper reports and the like.

	1878-88	1889-98	1899-08	1909-18	1919-28	1929-38	Net Totals
Palaeontology	237	709	920	1,205	547	2,552	6,170
Psychology	34	0	0	0	0	0	34
Neurology	77	2	0	0	0	0	79
Embryology	45	0	4	0	0	0	49
Heredity	1	104	0	0	29	9	143
Biography	3	76	20	219	771	143	1,232
Education	0	85	64	68	422	17	656
Administration	0	51	59	445	451	335	1,341
Evolution (Theory)	0	338	90	155	105	108	796
Anthropology	0	26	5	580	492	31	1,134
Conservation	0	0	26	23	44	0	93
Science and Religion	0	0	0	0	371	2	373
	397	1,391	1,188	2,695	3,232	3,197	12,100

From the figures above it will be seen that Osborn's strictly palaeontological writings constituted more than fifty per cent of his entire output. His contributions to psychology, neurology and embryology were relatively brief and practically limited to the first decade.

His publications under administration do not by any means measure his productive labors in that field, in which an enormous correspondence is on file and in which much was accomplished by personal contacts.

His publications listed under biography number about one hundred and six and range from brief single-page obituary notices to extensive works on Leidy, Cope, and Wallace. Especially in the longer biographies he endeavored to follow the historical development of the main ideas and principles that had been put forth by great men, who for the most part had been his own friends.

The Roosevelt Memorial, a building erected by the State of New York in memory of his lifelong friend, Theodore Roosevelt, may fairly be counted as Osborn's supreme achievement in biography, for although the first suggestion came from others, it was he, first as Chairman of the Roosevelt Memorial Commission, then as Chairman of the Board of Trustees of the New York State Roosevelt Memorial, who guided and inspired the entire project until it stood practically completed in the year of his death (1935). It is indeed a magnificent memorial in stone, bronze and mural painting, setting forth the life of a great naturalist, statesman and patriot.

The Roosevelt Memorial together with the American Museum of Natural History, with which it is articulated and integrated, affords a capital example of "creative evolution," the favorite principle of Osborn's later decades. As he watched wing after wing of the Museum itself and finally the capstone of the entire structure, the Roosevelt Memorial, rising under his wand, it is perhaps not surprising that he stressed the fact that there was something utterly new in the completed organization that was not present in any of its parts. He had repeatedly banished Chance from his cosmos and he therefore could not have granted that unpredictable combinations of diverse causal series had played a constant part in the development either of the Museum, or of the Roosevelt Memorial, or in his own history, or in the evolution of every organism of present and past ages.

"This discovery," he writes,[22] "of the firm and undeviating order with which palaeontology replaces all the chance explana-

[22] Address Delivered on the Occasion of the Dedication of the New Museum Building, 29 December, 1925: The Origin of Species, 1859-1925. Peabody Museum of Natural History, Bull. 1, no. 1, pp. 25-38.

tions of adaptation from Empedocles to Darwin is the supreme service which palaeontologic research renders to biology." But he does not tell us how, if there be no real freedom in the universe, the "creative evolution" of new effects becomes possible. In this connection, his brother, William Church Osborn, in response to an inquiry from the Reverend Henry S. Coffin, regarding the "long background which explains a man's view," attributed Henry Fairfield Osborn's view on creative evolution to the deeply religious nature of his mother and the training which she gave him in his formative years.

"He did not have a metaphysical mind," wrote his brother (*in litteris,* Dec. 3, 1935), "or a natural spirit of destructive skepticism. The whole tenor of his nature was towards creation and one of his last views on evolution was, if I correctly understood it, a belief that life contains within itself a creative power which leads it to adapt itself to its external surroundings and to create such new forms for itself as are required for its existence. This seems to me to be a distinctly religious conception as opposed to the mechanistic theory of straight survivalism by the selection of the fittest under the long processes of trial and error. I know that I once quoted to him a line from Lowell's 'Sir Launfal' which seemed to impress him deeply. I believe it is as follows:

> " 'Every clod feels a stir of might,
> An instinct within it which reaches and towers
> And, groping blindly above it for light,
> Climbs to a soul in grass and flowers.'

"I do not think he ever allowed what he did know to overcome his feeling for the vast reaches that he did not know but I think he carried his faith in the creative power over into the latter and regarded the subjects in which his life was spent as merely steps or processes in a great forwarding of creation."

Those of his scientific colleagues who were perhaps somewhat irritated by his numerous press interviews and publications dealing with religion and science failed to realize that he, as the

disciple of Dr. McCosh, consistently regarded evolution as an expression of the "firm and undeviating order" conceived by the divine creative mind.

That he was a deist, at least according to his own understanding of the term, there is no doubt. On the other hand, there is abundant evidence that he was not a Fundamentalist. He professed to be a Christian and although he was silent on doctrinal points, he lived in reverence to his God and in service to man.

It is not, however, as a harmonizer of religion and science that Osborn was acclaimed by his contemporaries and will be especially remembered by his successors. It is not even as the author of controversial writings in anthropology or of innumerable reviews and addresses on the theory of evolution. Republics are traditionally ungrateful and in the great universities that he served so well, his name, although engraved on the roster of their immortals, will become dim with time. Even the American Museum of Natural History may eventually forget that long ago he was its master builder. But to the future students of vertebrate palaeontology (and there will be many such if civilization endures) his numerous memoirs on fossil mammals will be an imperishable source.

And not the least of the great endowments that the world owes to Henry Fairfield Osborn is that, with the loyal aid of his colleagues and assistants, he founded and established a single great school of vertebrate palaeontology located in three harmoniously coöperating centers, Princeton University, Columbia University and the American Museum of Natural History; that in place of discord he left peace among the palaeontologists of America, many of whom are proud to have been either his students or students of his students.

A man of the highest ideals and standards as teacher, investigator, citizen; great in leadership and administration, a man of scrupulous honor, of disarming sincerity and fairness, generously giving credit to all who aided him, respecting the principle of academic freedom in his assistants even when they differed sharply from him. He was gentle, good humored, and consistently adored by his parents, brothers, wife, children and

grandchildren. His friends delighted in his society and his colleagues testified their admiration by awarding him the highest medals and honors in the leading scientific organizations of the world. And at the end of this crowded, happy life he died seated at his desk at Castle Rock, as he was preparing for another day's work on the Roosevelt Memorial.

BIBLIOGRAPHY OF HENRY FAIRFIELD OSBORN

(Extracted from the full bibliography in "Fifty-two Years of Research, Observation and Publication, 1877-1929," omitting references to newspapers, abstracts, preliminary announcements and popular articles.)

1878

Palæontological Report of the Princeton Scientific Expedition of 1877. (With W. B. Scott and Francis Speir, Jr.) *Contr. E. M. Mus. Geol. and Archæol. Princeton Coll.*, No. 1, pp. 7-106, pls. A and i-x.

1879

The Lower jaw of Loxolophodon. (With Francis Speir, Jr.) *Amer. Journ. Sci.*, (3), Vol. xvii, pp. 304-309.

On Some Points in the Early Development of the Common Newt. (With W. B. Scott.) *Quart. Journ. Micros. Sci.*, N. S., Vol. xix, pp. 449-475, pls. xx-xxi.

1880

Questions upon the Visualizing and other Allied Faculties. (With Francis Galton, F.R.S.) Privately printed, New York, 2-page leaflet.

1881

A Memoir upon Loxolophodon and Uintatherium, Two Genera of the Sub-Order Dinocerata. Accompanied by a Stratigraphical Report of the Bridger Beds in the Washakie Basin by John Bach McMaster. *Contr. E. M. Mus. Geol. and Archaeol. Coll. of New Jersey*, Vol. i, No. 1, pp. 5-54, pls. i-iv, 2 maps.

1882

Orthocynodon, an Animal related to the Rhinoceros, from the Bridger Eocene. (With W. B. Scott.) *Amer. Journ. Sci.*, (3) Vol. xxiv, pp. 223-225.

1883

On the Skull of the Eocene Rhinoceros, Orthocynodon, and the Relation of this Genus to Other Members of the Group. (With W. B. Scott.) *Contr. E. M. Mus. Geol. and Archæol. Princeton Coll.* Bull. No. 3, pp. 1-22.

On Achænodon, an Eocene Bunodont. *Contr. E. M. Mus. Geol. and Archæol. Princeton Coll.* Bull. No. 3, pp. 23-35.

Preliminary Observations upon the Brain of Amphiuma. *Proc. Acad. Nat. Sci. Phila.*, Vol. xxxv, pp. 177-186.

Observations upon the Fœtal Membranes of the Opossum and other Marsupials. *Quart. Journ. Micros. Sci.*, N. S., Vol. xxiii, pp. 473-484.

1884

A Study of the Mind's Chamber of Imagery. (With James McCosh.) *Princeton Review*, Vol. xiii, pp. 50-72.

Illusions of Memory. *North Amer. Review*, Vol. cxxxviii, pp. 476-486.
Visual Memory. *Journ. Christian Phil.*, Vol. iii, pp. 439-450.
Preliminary Observations upon the Brain of Menopoma. *Proc. Acad. Nat. Sci. Phila.*, Vol. xxxvi, pp. 262-274.

1885

A Simple Method of Injecting the Arteries and Veins in Small Animals. *Amer. Naturalist*, Vol. xix, pp. 920-921.
The Development of the Brain. *Reference Handbook, Medical Sci.*, Vol. i, First Edition, pp. 633-642.

1886

Observations upon the Presence of the Corpus Callosum in the Brain of Amphibians and Reptiles. *Zool. Anz.*, Band ix, pp. 200-205.
The Origin of the Corpus Callosum. A Contribution upon the Cerebral Commissures of the Vertebrata. *Morph. Jahrb.*, Band xii, pp. 223-251; pp. 530-543, pls. xiii, xiv, xxv.
Note upon the Cerebral Commissures in the lower Vertebrata and a probable Fornix Rudiment in the Brain of Tropidonotus. *Zool. Anz.*, Band ix, pp. 577-578.
Observations upon the Upper Triassic Mammals, Dromatherium and Microconodon. *Proc. Acad. Nat. Sci. Phila.*, Vol. xxxviii, pp. 359-363.

1887

Preliminary Account of the Fossil Mammals from the White River Formation contained in the Museum of Comparative Zoölogy. (With W. B. Scott.) *Bull. Mus. Comp. Zool.*, Vol. xiii, pp. 151-171, pls. i-ii.
The Relation of the Dorsal Commissures of the Brain to the Formation of the Encephalic Vesicles. *Amer. Naturalist*, Vol. xxi, pp. 940-941.
The Origin of the Tritubercular Type of Mammalian Dentition. *Science*, Vol. x, No. 254, Dec. 16, 1887, p. 300.
The Fœtal Membranes of the Marsupials. *Journ. Morph.*, Vol. i, pp. 373-382, pl. xvii.
The Triassic Mammals, Dromatherium and Microconodon. *Proc. Amer. Phil. Soc.*, Vol. xxiv, pp. 109-111, 1 pl.
Preliminary Report on the Vertebrate Fossils of the Uinta Formation collected by the Princeton Expedition of 1886. (With W. B. Scott.) *Proc. Amer. Phil. Soc.*, Vol. xxiv, pp. 255-264.

1888

The Mylohyoid Groove in the Mesozoic and Recent Mammalia. *Amer. Naturalist*, Vol. xxii, pp. 75-76.
Report of the Committee on Anatomical Nomenclature, with Special Reference to the Brain. (With Frank Baker.) *Proc. Amer. Assoc. Adv. Sci.*, Vol. xxxvi, p. 56.
A Review of Mr. Lydekker's Arrangement of the Mesozoic Mammalia. *Amer. Naturalist*, Vol. xxii, pp. 232-236.

A Contribution to the Internal Structure of the Amphibian Brain. *Journ. Morph.*, Vol. ii, pp. 51-96, pls. iv-vi.

On the Structure and Classification of the Mesozoic Mammalia. *Journ. Acad. Nat. Sci. Phila.*, (2), Vol. ix, pp. 186-265, pls. viii, ix.

The Nomenclature of the Mammalian Molar Cusps. *Amer. Naturalist*, Vol. xxii, pp. 926, 927.

Additional Observations upon the Structure and Classification of the Mesozoic Mammalia. *Proc. Acad. Nat. Sci. Phila.*, Vol. xl, pp. 292-301, pls. xxv, xxvi.

The Evolution of Mammalian Molars to and from the Tritubercular Type. *Amer. Naturalist*, Vol. xxii, pp. 1067-1079.

1889

The Palæontological Evidence for the Transmission of Acquired Characters. *Amer. Naturalist*, Vol. xxiii, pp. 561-566.

1890

Evolution and Heredity. Biol. Lectures, Marine Biol. Lab., Woods Hole, pp. 130-141.

Preliminary Account of the Fossil Mammals from the White River and Loup Fork Formations, contained in the Museum of Comparative Zoölogy, Part II—Perissodactyla. *Bull. Mus. Comp. Zool.*, Vol. xx, pp. 65-100, pls. i-iii.

The Mammalia of the Uinta Formation. III. The Perissodactyla. IV. The Evolution of the Ungulate Foot. *Trans. Amer. Phil. Soc.*, N. S., Vol. xvi, Pt. iii, pp. 461-572, pls. vii-x.

A Review of the Cernaysian Mammalia. *Proc. Acad. Nat. Sci. Phila.*, Vol. xlii, pp. 51-62.

1891

Are Acquired Variations Inherited? *Amer. Naturalist*, Vol. xxv, pp. 191-216.

A Review of the Cretaceous Mammalia. [Review of Marsh's "Discovery of the Cretaceous Mammalia" Pts. I and II.] *Proc. Acad. Nat. Sci. Phila.*, Vol. xliii, pp. 124-135. *Amer. Naturalist*, Vol. xxv, pp. 595-611.

A Reply to Professor Marsh's "Note on Mesozoic Mammalia." *Amer. Naturalist*, Vol. xxv, pp. 775-783.

Meniscotheriidæ and Chalicotherioidea. *Amer. Naturalist*, Vol. xxv, pp. 911-912.

1892

The Cartwright Lectures for 1892 before the Alumni of the College of Physicians and Surgeons, New York.—Present Problems in Evolution and Heredity. 1. The Contemporary Evolution of Man. 2. Difficulties in the Heredity Theory. 3. Heredity and the Germ Cells. *Medical Record*, Vol. 41, pp. 197-204; 253-261; 449-456; 533-534.

Nomenclature of Mammalian Molar Cusps. *Amer. Naturalist,* Vol. xxvi, pp. 436-437.

Palæonictis in the American Lower Eocene. *Nature,* Vol. 46, No. 1176, May 12, 1892, p. 30.

The Ancestry of Chalicotherium. *Science,* Vol. xix, No. 484, May 13, 1892, p. 276.

Is Meniscotherium a Member of the Chalicotherioidea? *Amer. Naturalist,* Vol. xxvi, pp. 507-509.

[Review.] Odontogenesis in the Ungulates. *Amer. Naturalist,* Vol. xxvi, pp. 621-623.

[Abstr.] A Reply to Professor Marsh's "Note on Mesozoic Mammalia." *Proc. Amer. Assoc. Adv. Sci.,* Vol. xl, p. 290.

What is Lophiodon? *Amer. Naturalist,* Vol. xxvi, pp. 763-765.

Fossil Mammals of the Wasatch and Wind River Beds. Collection of 1891. (With J. L. Wortman.) *Bull. Amer. Mus. Nat. Hist.,* Vol. iv, Art. xi, pp. 81-147.

The History and Homologies of the Human Molar Cusps. *Anat. Anz.,* vii Jahrg., Nos. 23, 24, pp. 740-747.

Characters of Protoceras (Marsh), the New Artiodactyl from the Lower Miocene. (With J. L. Wortman.) *Bull. Amer. Mus. Nat. Hist.,* Vol. iv, Art. xviii, pp. 351-371.

Biology and Other Science in the Schools. *Rept. Schoolmasters Assoc. New York and Vicinity,* 1892-3, pp. 35-42.

Sur la Découverte du Palæonictis en Amérique. *Bul. Soc. Géol. France,* (3), t. xx, pp. 434-436.

1893

Artionyx, a New Genus of Ancylopoda. (With J. L. Wortman.) *Bull. Amer. Mus. Nat. Hist.,* Vol. v, Art. i, pp. 1-18.

The Ancylopoda, Chalicotherium and Artionyx. *Amer. Naturalist,* Vol. xxvii, pp. 118-133.

Protoceras, the New Artiodactyl. *Nature,* Vol. 47, No. 1214, Feb. 2, 1893, pp. 321-322.

Artionyx—A Clawed Artiodactyl. *Nature,* Vol. 47, No. 1226, Apr. 27, 1893, pp. 610-611.

Aceratherium tridactylum from the Lower Miocene of Dakota. *Bull. Amer. Mus. Nat. Hist.,* Vol. v, Art. vii, pp. 85-86.

The Collection of Fossil Mammals in the American Museum of Natural History, New York. *Science,* Vol. xxi, No. 536, May 12, 1893, p. 261.

Recent Researches upon the Succession of Teeth in Mammals. *Amer. Naturalist,* Vol. xxvii, pp. 493-508.

Heredity in the Ovum and Spermatozoön. *Reference Handbook, Medical Sci.,* Supplement to Vol. ix, pp. 396-408.

Rise of the Mammalia in North America. *Amer. Journ. Sci.,* (3), Vol. xlvi, pp. 379-392; 448-466, pls. v-x.

School of Pure Science. Report of the Dean for the Academic Year ending June 30, 1893. *Fourth Annual Report of President Low to the Trustees*, pp. 141-149.

Fossil Mammals of the Upper Cretaceous Beds. *Bull. Amer. Mus. Nat. Hist.*, Vol. v, Art. xvii, pp. 311-330, pls. vii-viii.

Alte und neue Probleme der Phylogenese. *Ergebnisse, Anat. und Entwickelungsgesch.* Band iii, pp. 584-619.

A Three Year Course for the Degree (Ph.D.). *Columbia Univ. Miscel. Pub.*, 1893.

1894

The Degree of Doctor of Philosophy. Suggestions. (With Wm. A. Keener.) Reported in Minutes of Columbia Univ. Council dated January 16, 1894. 6 pp. Privately printed.

A Division of the Eutherian Mammals into the Mesoplacentalia and Cenoplacentalia. *Trans. N. Y. Acad. Sci.*, Vol. xiii, pp. 234-237.

Fossil Mammals of the Lower Miocene White River Beds. Collection of 1892. (With J. L. Wortman.) *Bull. Amer. Mus. Nat. Hist.*, Vol. vi, Art. vii, pp. 199-228, pls. ii-iii.

From the Greeks to Darwin. 8vo, Macmillan & Co., New York, 259 pp.

Certain Principles of Progressively Adaptive Variation Observed in Fossil Series. *Nature*, Vol. 50, No. 1296, Aug. 30, 1894, p. 435.

School of Pure Science. Report of the Dean for the Academic Year ending June 30, 1894. *Fifth Annual Report of President Low to the Trustees*, pp. 125-150.

[Preface to "Amphioxus and the Ancestry of the Vertebrates" by Arthur Willey.] Macmillan & Co., New York, 1894, pp. vii-ix.

1895

Environment in its Influence upon the Successive Stages of Development and as a Cause of Variation. *Science*, N. S., Vol. i, No. 2, Jan. 11, 1895, pp. 35-36.

Fossil Mammals of the Puerco Beds. Collection of 1892. (With Charles Earle.) *Bull. Amer. Mus. Nat. Hist.*, Vol. vii, Art. i, pp. 1-70.

A Visit to the Exhibit of the New York Academy of Sciences. *Sci. Amer.*, Vol. lxxii, pp. 233-234.

The Hereditary Mechanism and the Search for the Unknown Factors of Evolution. *Amer. Naturalist*, Vol. xxix, pp. 418-439.

Fossil Mammals of the Uinta Basin. Expedition of 1894. *Bull. Amer. Mus. Nat. Hist.*, Vol. vii, Art. ii, pp. 71-105.

Joints in the Vertebrate Skeleton. [Review of "The Origin of the Forms of Joints in the Vertebrate Skeleton," by Gustav Tornier, 1895.] *Science*, N. S., Vol. i, No. 21, May 24, 1895, pp. 581-582.

The History of the Cusps of the Human Molar Teeth. *Intern. Dental Journ.*, pp. 1-26, pl. AA.

Vertebrate Paleontology in the American Museum. *Science*, N. S., Vol. ii, No. 33, Aug. 16, 1895, pp. 178-179.

School of Pure Science. Report of Dean for the Academic Year ending June 30, 1895. *Sixth Annual Report of President Low to the Trustees,* pp. 151-181.

Memorial Tribute to Professor Huxley. *Trans. N. Y. Acad. Sci.,* Vol. xv, pp. 40-50.

Perissodactyls of the Lower Miocene White River Beds. (With J. L. Wortman.) *Bull. Amer. Mus. Nat. Hist.,* Vol. vii, Art. xii, pp. 343-375, pls. viii-xi.

1896

A Student's Reminiscences of Huxley. Biol. Lectures, Marine Biol. Lab., Woods Hole, pp. 29-42.

Titanotheres of the American Museum of Natural History. *Amer. Naturalist,* Vol. xxx, pp. 162-163.

The Corner-Stones of Learning. [Address on the laying of the Corner-stone of Schermerhorn Hall, Columbia University.] *Program of Dedication of the New Site, Morningside Heights,* May 2, 1896, pp. 43-49.

The Cranial Evolution of Titanotherium. *Bull. Amer. Mus. Nat. Hist.,* Vol. viii, Art. ix, pp. 157-197.

The Aim and Method of Science Study in Schools below the College. Biological Work in the High Schools. *Regents Bulletin,* No. 36, pp. 62-64.

Dentition of Lemurs and the Systematic Position of Tarsius. *Science,* N. S., Vol. iv, No. 99, Nov. 20, 1896, pp. 745-747.

Ontogenic and Phylogenic Variation. *Science,* N. S., Vol. iv, No. 100, Nov. 27, 1896, pp. 786-789.

Preliminary Plan for the Prosecution of the Work of the Zoological Society (with C. Grant La Farge & Andrew H. Green), pp. 3-10 of *N. Y. Zool. Soc. Reports on Site of Garden.*

1897

Lambdotherium not related to Palæosyops or the Titanotheres. *Amer. Naturalist,* Vol. xxxi, pp. 55-57.

Goode as a Naturalist. *Science,* N. S., Vol. v, No. 114, March 5, 1897, pp. 373-378.

[As Chairman.] Report of the Executive Committee to the Board of Managers. . . . *1st Ann. Rept. N. Y. Zool. Soc.,* pp. 23-25.

The Origin of the Teeth of the Mammalia. *Science,* N. S., Vol. v, No. 119, April 9, 1897, pp. 576-577.

The Ganodonta or Primitive Edentates with Enameled Teeth. *Science,* N. S., Vol. v, No. 120, April 16, 1897, pp. 611-612.

Edward D. Cope. *Science,* N. S., Vol. v, No. 123, May 7, 1897, pp. 705-717.

Homologies and Nomenclature of the Elements of the Molar Teeth. *Science,* N. S., Vol. vi, No. 142, Sept. 17, 1897, p. 436.

Organic Selection. *Science,* N. S., Vol. vi, No. 146, Oct. 15, 1897, pp. 583-587.

The Huerfano Lake Basin, Southern Colorado, and its Wind River and Bridger Fauna. *Bull. Amer. Mus. Nat. Hist.,* Vol. ix, Art. xxi, pp. 247-258.

The Limits of Organic Selection. *Amer. Naturalist,* Vol. xxxi, pp. 944-951.

Wind River and Bridger Beds in the Huerfano Lake Basin. *Amer. Naturalist,* Vol. xxxi, pp. 966-968.

Reconstruction of Phenacodus primævus, the most primitive Ungulate. *Amer. Naturalist,* Vol. xxxi, p. 980.

Tritubercuły: A Review Dedicated to the Late Professor Edward D. Cope. *Amer. Naturalist,* Vol. xxxi, pp. 993-1016.

Zoology at Columbia. *Columbia Univ. Bull.,* No. xviii, pp. 17-26.

1898

The Biological Problems of To-day: Palæontological Problems. *Science,* N. S., Vol. vii, No. 162, Feb. 4, 1898, pp. 145-147.

Palæontological Notes. *Science,* Vol. vii, No. 162, Feb. 4, 1898, pp. 164-165.

[Origin of the Mammalia.] *Science,* N. S., Vol. vii, No. 162, Feb. 4, 1898, pp. 176-178.

Preface to "Fossil Vertebrates in the American Museum of Natural History." Vol. i, pp. iii-vi.

[As Chairman.] Report of the Executive Committee to the Board of Managers. . . . *2nd Ann. Rept. N. Y. Zool. Soc.,* pp. 23-39.

A Complete Skeleton of Teleoceras fossiger. Notes on the Growth and Sexual Characters of this Species. *Bull. Amer. Mus. Nat. Hist.,* Vol. x, Art. iv, pp. 51-59, pls. iv, iv*a*.

A Placental Marsupial. *Science,* N. S., Vol. vii, No. 170, April 1, 1898, pp. 454-456.

A Complete Skeleton of Coryphodon radians. Notes upon the Locomotion of this Animal. *Bull. Amer. Mus. Nat. Hist.,* Vol. x, Art. vi, pp. 81-91, pl. x.

The Extinct Rhinoceroses. *Mem. Amer. Mus. Nat. Hist.,* Vol. i, Pt. iii, pp. 75-164, pls. xii*a*-xx.

A Complete Skeleton of Teleoceras, the True Rhinoceros from the Upper Miocene of Kansas. *Science,* N. S., Vol. vii, No. 173, April 22, 1898, pp. 554-557.

The Origin of the Mammalia [I]. *Amer. Naturalist,* Vol. xxxii, pp. 309-334.

Remounted Skeleton of Phenacodus primævus. Comparison with Euprotogonia. *Bull. Amer. Mus. Nat. Hist.,* Vol. x, Art. ix, pp. 159-164, pl. xii.

Evolution of the Amblypoda, Part I. Taligrada and Pantodonta. *Bull. Amer. Mus. Nat. Hist.,* Vol. x, Art. xi, pp. 169-218.

The New York Zoological Park. *Science*, N. S., Vol. vii, No. 179, June 3, 1898, pp. 759-764.

Additional Characters of the Great Herbivorous Dinosaur Camarasaurus. *Bull. Amer. Mus. Nat. Hist.*, Vol. x, Art. xii, pp. 219-233.

Models of Extinct Vertebrates. *Science*, N. S., Vol. vii, No. 182, June 24, 1898, pp. 841-845.

Wasatch and Bridger Beds in the Huerfano Lake Basin. *Proc. Amer. Assoc. Adv. Sci.*, Vol. xlvi, pp. 205-206.

[Abstr.] Modification and Variation, and the Limits of Organic Selection. *Proc. Amer. Assoc. Adv. Sci.*, Vol. xlvi, p. 239.

Senff Zoological Expedition to the Nile Valley. *Science*, N. S., Vol. viii, No. 199, Oct. 21, 1898, pp. 541-542.

1899

Frontal Horn on Aceratherium incisivum. Relation of this Type to Elasmotherium. *Ann. N. Y. Acad. Sci.*, Vol. xi, p. 487.

On Some Additional Characters of Diplodocus. *Ann. N. Y. Acad. Sci.*, Vol. xi, p. 487.

Habits of Thylacoleo. *Amer. Naturalist*, Vol. xxxiii, pp. 174-175.

Vertebrate Palæontology. [Review of "Outlines of Vertebrate Palæontology for Students of Zoology," by A. Smith Woodward.] *Natural Science*, Vol. xiv, No. 84, pp. 156-159.

Origin of Mammals. *Proc. 4th Intern. Cong. Zool.*, 1899, pp. 70-71; 413-419.

[As Chairman.] Report of the Executive Committee to the Board of Managers. . . . *3rd Ann. Rept. N. Y. Zool. Soc.*, May 1, 1899, pp. 25-38.

The International Catalogue of Scientific Literature. (With J. McK. Cattell and R. S. Woodward.) *Science*, N. S., Vol. x, No. 241, Aug. 11, 1899, pp. 165-167.

[International Catalogue of Scientific Literature]: K. Paleontology: L. Zoology. *Science*, N. S., Vol. x, No. 241, Aug. 11, 1899, pp. 170-171.

Recent Zoopaleontology. *Science*, N. S., Vol. x, No. 250, Oct. 13, 1899, pp. 538-539.

A Complete Mosasaur Skeleton, Osseous and Cartilaginous. *Mem. Amer. Mus. Nat. Hist.*, Vol. i, Pt. iv, pp. 167-189, pls. xxi-xxiii.

A Skeleton of Diplodocus. *Mem. Amer. Mus. Nat. Hist.*, Vol. i, Pt. v, pp. 191-214, pls. xxiv-xxviii.

Fore and Hind Limbs of Carnivorous and Herbivorous Dinosaurs from the Jurassic of Wyoming. *Bull. Amer. Mus. Nat. Hist.*, Vol. xii, Art. xi, pp. 161-172.

On Pliohyrax Kruppi Osborn, a Fossil Hyracoid, from Samos, Lower Pliocene, in the Stuttgart Collection. A New Type, and the First Known Tertiary Hyracoid. *Proc. 4th Intern. Congr. Zool.*, 1899, pp. 172-173.

Restoration of Extinct Vertebrates, from the American Museum of Natural History. *Proc. 4th Intern. Congr. Zool.*, 1899, p. 174.

1900

Intercentra and Hypapophyses in the Cervical Region of Mosasaurs, Lizards and Sphenodon. *Amer. Naturalist,* Vol. xxxiv, pp. 1-7.

A Glacial Pot-hole in the Hudson River Shales near Catskill, N. Y. *Amer. Naturalist,* Vol. xxxiv, pp. 33-36.

Recent Zoopaleontology. *Science,* N. S., Vol. xi, No. 264, Jan. 19, 1900, pp. 115-116.

The Angulation of the Limbs of Proboscidea, Dinocerata, and Other Quadrupeds in Adaptation to Weight. *Amer. Naturalist,* Vol. xxxiv, pp. 89-94.

The Geological and Faunal Relations of Europe and America during the Tertiary Period and the Theory of the Successive Invasions of an African Fauna. *Science,* N. S., Vol. xi, No. 276, Apr. 13, 1900, pp. 561-574.

[As Chairman.] Report of the Executive Committee to the Board of Managers. . . . *4th Ann. Rept. N. Y. Zool. Soc.*, pp. 27-41.

[Address of Welcome at the Opening of the New York Zoological Park.] *4th Ann. Rept. N. Y. Zool. Soc.*, pp. 76-78.

Progress of the New York Zoological Park. *Science,* N. S., Vol. xi, No. 286, June 22, 1900, pp. 963-965.

The International Catalogue of Scientific Literature. *Science,* N. S., Vol. xii, No. 290, July 20, 1900, p. 113.

Correlation Between Tertiary Mammal Horizons of Europe and America. *Ann. N. Y. Acad. Sci.*, Vol. xiii, pp. 1-72.

The Eighth International Geological Congress at Paris. *Science,* N. S., Vol. xii, No. 299, Sept. 21, 1900, pp. 440-442.

Reconsideration of the Evidence for a Common Dinosaur-Avian Stem in the Permian. *Amer. Naturalist,* Vol. xxxiv, pp. 777-799.

Recent Zoopaleontology. *Science,* N. S., Vol. xii, No. 307, Nov. 16, 1900, pp. 767-769.

Origin of the Mammalia, III. Occipital Condyles of Reptilian Tri-partite Type. *Amer. Naturalist,* Vol. xxxiv, pp. 943-947.

Phylogeny of the Rhinoceroses of Europe. *Bull. Amer. Mus. Nat. Hist.*, Vol. xiii, Art. xix, pp. 229-267.

Oxyæna and Patriofelis Restudied as Terrestrial Creodonts. *Bull. Amer. Mus. Nat. Hist.*, Vol. xiii, Art. xx, pp. 269-281.

Work in the Mammals. *Proc. Amer. Phil. Soc. Memorial Volume I,* pp. 296-303.

1901

The Recent Progress of Vertebrate Palæontology in America. *Science,* N. S., Vol. xiii, No. 315, Jan. 11, 1901, pp. 45-49.

The Attitude of the State Toward Scientific Investigation. *Science,* N. S., Vol. xiii, No. 316, Jan. 18, 1901, pp. 81-85.

Recent Progress in Paleontology. *Science,* N. S., Vol. xiii, No. 335, May 31, 1901, pp. 872-873.

[As Chairman.] Report of the Executive Committee to the Board of Managers. . . . *5th Ann. Rept. N. Y. Zool. Soc.,* pp. 33-42.

Fore and Hind Limbs of Sauropoda from the Bone Cabin Quarry. (With Walter Granger.) *Bull. Amer. Mus. Nat. Hist.,* Vol. xiv, Art. xiii, pp. 199-208.

Mémoires présentés au Congrès de Paris. *Comptes Rendus Congrès Géol. Intern., viii^e Session,* Fasc. 1, pp. 353-356, 357-363.

Professor Fraas on the Aqueous vs. Æolian Depositions of the White River Oligocene of S. Dakota. [Unsigned.] *Science,* N. S., Vol. xiv, No. 345, Aug. 9, 1901, pp. 210-212.

Recent Zoopaleontology. *Science,* N. S., Vol. xiv, No. 348, Aug. 30, 1901, pp. 330-331.

Recent Zoopaleontology. *Science,* N. S., Vol. xiv, No. 352, Sept. 27, 1901, pp. 498-499.

[Review of J. B. Hatcher's Memoir on Diplodocus Marsh in Mem. Carnegie Mus., Vol. I.] *Science,* N. S., Vol. xiv, No. 353, Oct. 4, 1901, pp. 531-532.

Recent Zoopaleontology. *Science,* N. S., Vol. xiv, No. 354, Oct. 11, 1901, pp. 578-580.

Recent Zoopaleontology. *Science,* N. S., Vol. xiv, No. 357, Nov. 1, 1901, pp. 699-700.

1902

Dolichocephaly and Brachycephaly in the Lower Mammals. *Bull. Amer. Mus. Nat. Hist.,* Vol. xvi, Art. vii, pp. 77-89.

The Four Phyla of Oligocene Titanotheres. *Bull. Amer. Mus. Nat. Hist.,* Vol. xvi, Art. viii, pp. 91-109.

Recent Zoopaleontology. *Science,* N. S., Vol. xv, No. 374, Feb. 28, 1902, pp. 355-357.

Recent Zoopaleontology. *Science,* N. S., Vol. xv, No. 378, Mar. 28, 1902, p. 514.

Homoplasy as a Law of Latent or Potential Homology. *Amer. Naturalist,* Vol. xxxvi, pp. 259-271.

[As Chairman.] Report of the Executive Committee to the Board of Managers. . . . *6th Ann. Rept. N. Y. Zool. Soc.,* pp. 35-43.

The Law of Adaptive Radiation. *Amer. Naturalist,* Vol. xxxvi, pp. 353-363.

Henri Filhol, Paleontologist. *Science,* N. S., Vol. xv, No. 388, June 6, 1902, p. 912.

American Eocene Primates, and the Supposed Rodent Family Mixodectidæ. *Bull. Amer. Mus. Nat. Hist.,* Vol. xvi, Art. xvii, pp. 169-214.

On Vertebrata of the Mid-Cretaceous of the North West Territory. 1. Distinctive Characters of the Mid-Cretaceous Fauna. *Contr. Canadian Pal.* (4to), Vol. iii, Pt. ii, pp. 1-81, pls. i-xxi.

Recent Zoopaleontology. *Science,* N. S., Vol. xvi, No. 408, Oct. 24, 1902, pp. 673-676.

Recent Zoopaleontology. *Science,* N. S., Vol. xvi, No. 409, Oct. 31, 1902, pp. 713-715.

Recent Zoopaleontology. *Science,* N. S., Vol. xvi, No. 410, Nov. 7, 1902, pp. 749-752.

The Fossil Tree Bridge in the Arizona Petrified Forest. *Science,* N. S., Vol. xvi, No. 416, Dec. 19, 1902, p. 991.

1903

Recent Zoopaleontology. *Science,* N. S., Vol. xvii, No. 421, Jan. 23, 1903, pp. 157-158.

Report of Advisory Committee on Paleontology. (With Henry Shaler Williams.) Report of Advisory Committee on Zoology. (With Edmund B. Wilson and W. K. Brooks.) *Year Book Carnegie Inst.,* 1902, pp. 174-184.

Evolution of the Proboscidea in North America. *Science,* N. S., Vol. xvii, No. 424, Feb. 13, 1903, p. 249.

The New York Zoological Park and Aquarium. *Science,* N. S., Vol. xvii, No. 424, Feb. 13, 1903, pp. 265-267.

Recent Zoopaleontology. *Science,* N. S., Vol. xvii, No. 425, Feb. 20, 1903, pp. 312-314.

Recent Zoopaleontology. *Science,* N. S., Vol. xvii, No. 426, Feb. 27, 1903, pp. 356-357.

On the Age of the Belly River Series or Formation in Canada. *Ottawa Naturalist,* Vol. xvi, pp. 227-228.

[As Chairman.] Report of the Executive Committee to the Board of Managers. . . . *7th Ann. Rept. N. Y. Zool. Soc.,* pp. 33-49.

Progress of the Concilium Bibliographicum. *Science,* N. S., Vol. xvii, No. 441, June 12, 1903, pp. 951-952.

Ornitholestes hermanni, a New Compsognathoid Dinosaur from the Upper Jurassic. *Bull. Amer. Mus. Nat. Hist.,* Vol. xix, Art. xii, pp. 459-464.

New York Zoological Park. *Science,* N. S., Vol. xviii, No. 450, Aug. 14, 1903, pp. 218-219.

Glyptotherium texanum, a new Glyptodont, from the Lower Pleistocene of Texas. *Bull. Amer. Mus. Nat. Hist.,* Vol. xix, Art. xvii, pp. 491-494, pl. xliii.

The Reptilian Subclasses Diapsida and Synapsida and the Early History of the Diaptosauria. *Mem. Amer. Mus. Nat. Hist.,* Vol. i, Pt. viii, pp. 451-507.

Recent Zoopaleontology. *Science,* N. S., Vol. xviii, No. 464, Nov. 20, 1903, pp. 665-668.

Recent Zoopaleontology. *Science,* N. S., Vol. xviii, No. 465, Nov. 27, 1903, pp. 699-702.

The Skull of Creosaurus. *Bull. Amer. Mus. Nat. Hist.,* Vol. xix, Art. xxxi, pp. 697-701.

Recent Zoopaleontology. *Science,* N. S., Vol. xviii, No. 469, Dec. 25, 1903, pp. 835-837.

Explorations and Researches of the Department of Vertebrate Paleontology. Preface to "Fossil Vertebrates in the American Museum of Natural History," Vol. ii, pp. iii-xix.

1904

Recent Zoopaleontology. *Science,* N. S., Vol. xix, No. 470, Jan. 1, 1904, pp. 35-36.

Karl Alfred von Zittel. *Science,* N. S., Vol. xix, No. 474, Jan. 29, 1904, pp. 186-188.

Recent Zoopaleontology. *Science,* N. S., Vol. xix, No. 476, Feb. 12, 1904, pp. 271-272.

[Resting Position of the Tasmanian Wolf.] *Nature,* Vol. 69, No. 1799, Apr. 21, 1904, p. 587.

Paleontological Evidence for the Original Tritubercular Theory. *Amer. Journ. Sci.,* (4), Vol. xvii, pp. 321-323, pl. xxi.

Recent Advances in our Knowledge of the Evolution of the Horse. *Proc. Amer. Phil. Soc.,* Vol. xliii, No. 176, pp. 156-157.

An Armadillo from the Middle Eocene (Bridger) of North America. *Bull. Amer. Mus. Nat. Hist.,* Vol. xx, Art. xii, pp. 163-165.

Progress of the Concilium Bibliographicum. *Science,* N. S., Vol. xix, No. 490, May 20, 1904, pp. 803-805.

New Oligocene Horses. *Bull. Amer. Mus. Nat. Hist.,* Vol. xx, Art. xiii, pp. 167-179, pl. v.

Manus, Sacrum, and Caudals of Sauropoda. *Bull. Amer. Mus. Nat. Hist.,* Vol. xx, Art. xiv, pp. 181-190.

Teleorhinus browni—A Teleosaur in the Fort Benton. *Bull. Amer. Mus. Nat. Hist.,* Vol. xx, Art. xxi, pp. 239-240.

New Miocene Rhinoceroses with Revision of Known Species. *Bull. Amer. Mus. Nat. Hist.,* Vol. xx, Art. xxvii, pp. 307-326.

The Great Cretaceous Fish Portheus molossus Cope. *Bull. Amer. Mus. Nat. Hist.,* Vol. xx, Art. xxxi, pp. 377-381.

1905

The Evolution of the Horse. *Rept. Brit. Assoc. Adv. Sci.,* 74th meeting, pp. 607-608.

Recent Discoveries of Extinct Animals in the Rocky Mountain Region and Their Bearings on the Present Problems of Evolution. *Science,* N. S., Vol. xxi, No. 523, Jan. 6, 1905, p. 28.

Recent Zoopaleontology. *Science,* N. S., Vol. xxi, No. 530, Feb. 24, 1905, pp. 315-316.

Ten Years' Progress in the Mammalian Palæontology of North America. *Comptes rendus, 6me Congrès Intern. Zool.,* 1904, pp. 86-113, pls. i-xv.

Evolution of the Horse. Recent Studies and Discoveries. *Comptes rendus, 6me Congrès Intern. Zool.,* 1904, p. 282.

History of a White Rhinoceros Skull. *Nature,* Vol. 72, No. 1858, June 8, 1905, p. 127.

Recent Vertebrate Paleontology. Fossil Mammals of Mexico. *Science,* N. S., Vol. xxi, No. 546, June 16, 1905, pp. 931-932.

The Ideas and Terms of Modern Philosophical Anatomy. *Science,* N. S., Vol. xxi, No. 547, June 23, 1905, pp. 959-961.

The Fossil Arachnida of Bohemia. [Review of "Neue Fische und Reptilien" by Fritsch.] *Science,* N. S., Vol. xxii, No. 550, July 14, 1905, p. 57.

The Classification of the Reptilia. *Ann. N. Y. Acad. Sci.,* Vol. xvi, pp. 302-303.

Recent Vertebrate Paleontology. *Science,* N. S., Vol. xxii, No. 554, Aug. 11, 1905, pp. 188-189.

Skull and Skeleton of the Sauropodous Dinosaurs, Morosaurus and Brontosaurus. *Science,* N. S., Vol. xxii, No. 560, Sept. 22, 1905, pp. 374-376.

Tyrannosaurus and Other Cretaceous Carnivorous Dinosaurs. *Bull. Amer. Mus. Nat. Hist.,* Vol. xxi, Art. xiv, pp. 259-265.

Origin and History of the Horse. Address before the New York Farmers, Dec. 19, 1905, pp. 1-16.

1906

Mountain Goat Hunting with the Camera. *10th Ann. Rept. N. Y. Zool. Soc.,* pp. 217-233.

The Skeleton of Brontosaurus and Skull of Morosaurus. *Nature,* Vol. 73, No. 1890, Jan. 18, 1906, pp. 282-284.

The Seven Factors of Education. *Educational Review,* Vol. xxxii, pp. 56-82.

Recent Vertebrate Paleontology. *Science,* N. S., Vol. xxiv, No. 602, July 13, 1906, pp. 55-57.

Milk Dentition of the Hyracoid Saghatherium from the Upper Eocene of Egypt. *Bull. Amer. Mus. Nat. Hist.,* Vol. xxii, Art. xiii, pp. 263-266.

Tyrannosaurus, Upper Cretaceous Carnivorous Dinosaur. *Bull. Amer. Mus. Nat. Hist.,* Vol. xxii, Art. xvi, pp. 281-296.

Recent Vertebrate Paleontology. *Science,* N. S., Vol. xxiv, No. 606, Aug. 10, 1906, pp. 184-185.

The Causes of Extinction of Mammalia. *Amer. Naturalist,* Vol. xl, pp. 769-795; 829-859.

[Letter Relating to Secretaryship of Smithsonian Institution.] *Science,* N. S., Vol. xxiv, No. 625, Dec. 21, 1906, pp. 825-826.

1907

The Fayûm Expedition of the American Museum. *Science,* N. S., Vol. xxv, No. 639, Mar. 29, 1907, pp. 513-516.

Tertiary Mammal Horizons of North America. *Bull. Amer. Mus. Nat. Hist.,* Vol. xxiii, Art. xi, pp. 237-253.

A Mounted Skeleton of the Columbian Mammoth (Elephas columbi). *Bull. Amer. Mus. Nat. Hist.,* Vol. xxiii, Art. xii, pp. 255-257.

Points of the Skeleton of the Arab Horse. *Bull. Amer. Mus. Nat. Hist.,* Vol. xxiii, Art. xiii, pp. 259-263.

A Mounted Skeleton of Naosaurus, a Pelycosaur from the Permian of Texas. *Bull. Amer. Mus. Nat. Hist.,* Vol. xxiii, Art. xiv, pp. 265-270.

Concilium Bibliographicum. *Science,* N. S., Vol. xxvi, No. 660, Aug. 23, 1907, pp. 260-261.

Evolution of Mammalian Molar Teeth to and from the Triangular Type. 8vo, The Macmillan Company, New York and London, 250 pp. (Edited by Dr. W. K. Gregory.)

Evolution as it Appears to the Paleontologist. *Science,* N. S., Vol. xxvi, No. 674, Nov. 29, 1907, pp. 744-749.

Foreword to the Monographs on Vertebrate Paleontology. [Preface to "The Ceratopsia" by J. B. Hatcher and R. S. Lull.] *Monographs, U. S. Geol. Survey,* Vol. xlix, pp. xiii-xxvi.

[Abstr.] The Reclassification of the Mammalia. *Ann. N. Y. Acad. Sci.,* Vol. xvii, pp. 611-613.

1908

The Four Inseparable Factors of Evolution. Theory of their Distinct and Combined Action in the Transformation of the Titanotheres, an Extinct Family of Hoofed Animals in the Order Perissodactyla. *Science,* N. S., Vol. xxvii, No. 682, Jan. 24, 1908, pp. 148-150.

[As Chairman.] Report of the Executive Committee to the Board of Managers. *12th Ann. Rept. N. Y. Zool. Soc.,* pp. 29-39.

Morris K. Jesup. *Science,* N. S., Vol. xxvii, No. 684, Feb. 7, 1908, pp. 235-236.

New Fossil Mammals from the Fayûm Oligocene, Egypt. *Bull. Amer. Mus. Nat. Hist.,* Vol. xxiv, Art. xvi, pp. 265-272.

Explorations and Researches of the Department of Vertebrate Palæontology. (With W. D. Matthew.) Preface to "Fossil Vertebrates in the American Museum of Natural History," Vol. iii, pp. iii-viii.

Coincident Evolution Through Rectigradations. *Science,* N. S., Vol. xxvii, No. 697, May 8, 1908, pp. 749-752.

[As President.] Thirty-ninth Annual Report of the Trustees of the American Museum of Natural History [for the year 1907.] 120 pp.

A Paleontological Trip to Northwestern Nebraska. *Ann. N. Y. Acad. Sci.,* Vol. xviii, pp. 351-352.

New or Little Known Titanotheres from the Eocene and Oligocene. *Bull. Amer. Mus. Nat. Hist.,* Vol. xxiv, Art. xxxii, pp. 599-617.

1909

Cenozoic Mammal Horizons of Western North America. With Faunal Lists of the Tertiary Mammalia of the West by William Diller Matthew. *Bull.* 361 *U. S. Geol. Survey,* pp. 1-138.

[As Chairman.] Report of the Executive Committee to the Board of Managers. *13th Ann. Rept. N. Y. Zool. Soc.,* pp. 31-43.

Darwin Celebrations in the United States. *Nature,* Vol. 80, No. 2055, Mar. 18, 1909, pp. 72-73.

Life and Works of Darwin. *Pop. Sci. Monthly,* Vol. lxxiv, pp. 315-343.

Darwin and Palæontology, in "Fifty Years of Darwinism," 8vo, Henry Holt & Co., New York, pp. 209-250.

Geological Correlation Through Vertebrate Paleontology by International Coöperation. Correlation Bull. No. 1. Plan and Scope. (With Dr. W. D. Matthew.) *Ann. N. Y. Acad. Sci.,* Vol. xix, pp. 41-44.

[As President.] Fortieth Annual Report of the Trustees of the American Museum of Natural History for the Year 1908. 118 pp.

The Epidermis of an Iguanodont Dinosaur. *Science,* N. S., Vol. xxix, No. 750, May 14, 1909, pp. 793-795.

To the Philosophic Zoölogist. *Science,* N. S., Vol. xxix, No. 753, June 4, 1909, pp. 895-896.

The Feeding Habits of Mœritherium and Palæomastodon. *Nature,* Vol. 81, No. 2074, July 29, 1909, pp. 139-140.

Acceptance of the Portrait of Darwin. *Ann. N. Y. Acad. Sci.,* Vol. xix, pp. 21-22.

The Upper Cretaceous Iguanodont Dinosaurs. *Nature,* Vol. 81, No. 2075, Aug. 5, 1909, pp. 160-162.

New Carnivorous Mammals from the Fayûm Oligocene, Egypt. *Bull. Amer. Mus. Nat. Hist.,* Vol. xxvi, Art. xxviii, pp. 415-424.

1910

History, Plan and Scope of the American Museum of Natural History. 4to, New York, 176 pp.

Address of Welcome at Commemoration of the Founding of the American Museum of Natural History. Unveiling of the Statue of Morris K. Jesup. *Amer. Mus. Journ.,* Vol. x, pp. 60-67.

The Paleontologic Correlation Through the Bache Fund. *Science,* N. S., Vol. xxxi, No. 794, Mar. 18, 1910, pp. 407-408.

Correlation of the Cenozoic Through its Mammalian Life. *Journ. Geol.,* Vol. xviii, pp. 201-215.

[As President.] Forty-first Annual Report of the Trustees of the American Museum of Natural History for the Year 1909. 131 pp.

Paleontologic Evidences of Adaptive Radiation. *Pop. Science Monthly,* Vol. lxxvii, pp. 77-81.

The Age of Mammals in Europe, Asia, and North America. 8vo, The Macmillan Company, New York, 635 pp.

[Abstr.] A Means of Estimating the Age of the Mastodon and Other Proboscidea. Separates issued in 1910. *Proc. 7th Intern. Congr. Zool.*, 1907, pp. 782-784.

Huxley on Education. *Columbia Univ. Quart.*, Vol. xiii, pp. 25-38.

1911

A Dinosaur Mummy. *Amer. Mus. Journ.*, Vol. xi, pp. 7-11.

[As President.] Forty-second Annual Report of the Trustees of the American Museum of Natural History for the Year 1910. 144 pp.

"Mutations" of Waagen and "Mutations" of De Vries or [and] "Rectigradations" of Osborn. *Science*, N. S., Vol. xxxiii, No. 844, Mar. 3, 1911, p. 328.

Growth of the Building of the American Museum of Natural History. (With the Administrative Staff.) Roy. 4to, New York, 23 pp.

Biological Conclusions drawn from the Study of the Titanotheres. *Science*, N. S., Vol. xxxiii, No. 856, May 26, 1911, pp. 825-828.

Palæontology. *Encyclopædia Brittanica* (11th ed.), Vol. xx, pp. 579-591, pls. i-ii.

The Museum of the Future. *Amer. Mus. Journ.*, Vol. xi, pp. 223-225.

1912

Darwin's Theory of Evolution by the Selection of Minor Saltations. *Amer. Naturalist*, Vol. xlvi, pp. 76-82.

[As President.] Forty-third Annual Report of the Trustees of the American Museum of Natural History for the Year 1911. 173 pp.

First Use of the Word "Genotype." *Science*, N. S., Vol. xxxv, No. 896, Mar. 1, 1912, pp. 340-341.

Phylogeny and Ontogeny of the Horns of Mammals. *Science*, Vol. xxxv, No. 902, Apr. 12, 1912, pp. 595-596.

Skull Measurements in Man and the Hoofed Mammals. *Science*, N. S., Vol. xxxv, No. 902, Apr. 12, 1912, p. 596.

Preservation of the World's Animal Life. *Amer. Mus. Journ.*, Vol. xii, pp. 123-124.

The Continuous Origin of Certain Unit Characters as Observed by a Palæontologist. *Harvey Soc. Volume*, 7th ser., pp. 153-204.

[Abstr.] Zoogeographical Relations of North Africa in the Upper Eocene. *Proc. 7th Intern. Congr. Zool.*, 1907, p. 740.

Correlation and Paleogeography. *Bull. Geol. Soc. Amer.*, Vol. xxiii, pp. 232-256.

Scientific Worthies. xxviii.—Dr. Alfred Russel Wallace. *Nature*, Vol. 89, No. 2224, June 13, 1912, pp. 367-370.

Tetraplasy, the Law of the Four Inseparable Factors of Evolution. *Journ. Acad. Nat. Sci. Phila.*, (2), Vol. xv, pp. 275-309.

Crania of Tyrannosaurus and Allosaurus. *Mem. Amer. Mus. Nat. Hist.*, N. S., Vol. i, Pt. i, pp. 1-30, pls. i-iv, figs. 1-27.

Integument of the Iguanodont Dinosaur Trachodon. *Mem. Amer. Mus. Nat. Hist.*, N. S., Vol. i, Pt. ii, pp. 33-54, pls. v-x, figs. 1-13.

Craniometry of the Equidæ. *Mem. Amer. Mus. Nat. Hist.*, N. S., Vol. i, Pt. iii, pp. 57-100, figs. 1-17.

The State Museum and State Progress. *Science*, N. S., Vol. xxxvi, No. 929, Oct. 18, 1912, pp. 493-504.

Men of the Old Stone Age. With an Account of a Motor Tour Through the Principal Cavern Regions of Southwestern Europe. *Amer. Mus. Journ.*, Vol. xii, pp. 279-295.

1913

[As President.] Forty-fourth Annual Report of the Trustees of the American Museum of Natural History for the Year 1912. 208 pp.

Biographical Memoir of Joseph Leidy, 1823-1891. *Biographical Memoirs National Acad. Sci.*, Vol. vii, pp. 339-396.

Tyrannosaurus, Restoration and Model of the Skeleton. *Bull. Amer. Mus. Nat. Hist.*, Vol. xxxii, Art. iv, pp. 91-92, pls. iv-vi.

The Horse Past and Present in the American Museum of Natural History. Issued by the American Museum, May 6, 1913, 4to, 37 pp.

The Museum and Nature Study in the Public Schools. (With George H. Sherwood.) *Miscel. Pub. Amer. Mus. Nat. Hist.*, No. 3, 1913, 13 pp.

Eomoropus, an American Eocene Chalicothere. *Bull. Amer. Mus. Nat. Hist.*, Vol. xxxii, Art. xiv, pp. 261-274.

Lower Eocene Titanotheres. Genera Lambdotherium, Eotitanops. *Bull. Amer. Mus. Nat. Hist.*, Vol. xxxii, Art. xxi, pp. 407-415.

The Skull of Bathyopsis, Wind River Uintathere. *Bull. Amer. Mus. Nat. Hist.*, Vol. xxxii, Art. xxii, pp. 417-420.

Alfred Russel Wallace. *Pop. Sci. Monthly*, Vol. lxxxiii, pp. 523-537.

A Great Naturalist, Alfred Russel Wallace, 1823-1913. *Amer. Mus. Journ.*, Vol. xiii, pp. 331-333.

1914

[As President.] Forty-fifth Annual Report of the Trustees of the American Museum of Natural History for the Year 1913. 192 pp.

Close of the Cretaceous and Opening of Eocene Time in North America. *Bull. Geol. Soc. Amer.*, Vol. xxv, pp. 321-323.

Recent Results in the Phylogeny of the Titanotheres. *Bull. Geol. Soc. Amer.*, Vol. xxv, pp. 403-405.

[Abstr.] New Methods of Restoring Eotitanops and Brontotherium. *Bull. Geol. Soc. Amer.*, Vol. xxv, p. 406.

Restoration of the World Series of Elephants and Mastodons. *Bull. Geol. Soc. Amer.*, Vol. xxv, pp. 407-410.

The Broom Fossil Reptile Collection. *Amer. Mus. Journ.*, Vol. xiv, pp. 137-138.

1915

[As President.] Forty-sixth Annual Report of the Trustees of the American Museum of Natural History for the Year 1914. 192 pp.

Origin of Single Characters as Observed in Fossil and Living Animals and Plants. *Amer. Naturalist,* Vol. xlix, pp. 193-240.

Eberhard Fraas. *Science,* N. S., Vol. xli, No. 1059, April 16, 1915, pp. 571-572.

Review of the Pleistocene of Europe, Asia, and Northern Africa. *Ann. N. Y. Acad. Sci.,* Vol. xxvi, pp. 215-315, 20 text figs.

Close of Jurassic and Opening of Cretaceous Time in North America. Introduction to Symposium. *Bull. Geol. Soc. Amer.,* Vol. xxvi, pp. 295-302, 1 text fig.

The Origin of New Adaptive Characters. [A Reply.] *Nature,* Vol. 96, No. 2402, Nov. 11, 1915, pp. 284-285.

Men of the Old Stone Age, Their Environment, Life, and Art. 8vo, Charles Scribner's Sons, New York, 545 pp., pls. i-viii, 268 text figs.

1916

[As President.] Forty-seventh Annual Report of the Trustees of the American Museum of Natural History for the Year 1915. 194 pp.

The Museum as the New Force in Public School Development. *Journ. National Inst. Social Sci.,* Vol. ii (1916), pp. 155-157 (abbreviated).

Gustav Schwalbe. *Science,* N. S., Vol. xliv, No. 1125, July 21, 1916, p. 97.

Two New Oligocene Titanotheres. *Bull. Amer. Mus. Nat. Hist.,* Vol. xxxv, Art. xl, pp. 721-723.

1917

Skeletal Adaptations of Ornitholestes, Struthiomimus, Tyrannosaurus. *Bull. Amer. Mus. Nat. Hist.,* Vol. xxxv, Art. xliii, pp. 733-771, pls. xxiv-xxvi, text figs. 1-21.

Application of the Laws of Action, Reaction and Interaction in Life Evolution. *Proc. National Acad. Sci.,* Vol. iii, pp. 7-9.

[Abstr.] Skeleton and Restoration of Camarasaurus. (With C. C. Mook.) *Bull. Geol. Soc. Amer.,* Vol. xxviii, p. 215.

[As President.] Forty-eighth Annual Report of the Trustees of the American Museum of Natural History for the Year 1916. 235 pp.

The "Ostrich" Dinosaur and the "Tyrant" Dinosaur. *Amer. Mus. Journ.,* Vol. xvii, pp. 5-13, 9 text figs.

Heritage and Habitus. *Science,* N. S., Vol. xlv, No. 1174, June 29, 1917, pp. 560-561.

The Museum as the New Force in Public School Development. *Journ. National Education Assoc.,* Vol. i, pp. 735-736.

The Daniel Giraud Elliot Medal. *Science,* N. S., Vol. xlvi, No. 1178, July 27, 1917, pp. 85-86.

Biocharacters as Separable Units of Organic Structure. *Amer. Naturalist,* Vol. li, pp. 449-456.

Algonkian Bacteria and Popular Science. *Science,* N. S., Vol. xlvi, No. 1192, Nov. 2, 1917, pp. 432-434. See also *Science,* N. S., Vol. xlvi, No. 1184, Sept. 7, 1917, pp. 238-239.

The Crocker Land Expedition Home. *Amer. Mus. Journ.,* Vol. xvii, p. 365.

The Origin and Evolution of Life on the Theory of Action, Reaction, and Interaction. 8vo, Charles Scribner's Sons, New York, 322 pp., frontispiece, 135 text figs.

Native Grasses of Australia. *Nature,* Vol. 100, No. 2505, Nov. 1, 1917, p. 165.

1918

Observations on the Skeleton of Moropus cooki in the American Museum. *Bull. Geol. Soc. Amer.,* Vol. xxix, pp. 131-133.

A Long-Jawed Mastodon Skeleton from South Dakota and Phylogeny of the Proboscidea. *Bull. Geol. Soc. Amer.,* Vol. xxix, pp. 133-137.

[As President.] Forty-ninth Annual Report of the Trustees of the American Museum of Natural History for the Year 1917. 239 pp.

Equidæ of the Oligocene, Miocene, and Pliocene of North America, Iconographic Type Revision. *Mem. Amer. Mus. Nat. Hist.,* N. S., Vol. ii, Pt. i, 217 pp., 54 pls., 173 text figs.

Nature in the Schools. [Preface to "Free Education in the American Museum of Natural History in Public Schools and Colleges: History and Status in 1917," by George H. Sherwood, Curator.] *Miscel. Pub. Amer. Mus. Nat. Hist.,* No. 10, 1918, pp. 5, 6.

1919

The Proposed Washington-Lafayette School for Boys in France. *School and Soc.,* Vol. viii, pp. 442-444; 471-473; 592-597; 625-629; Vol. ix, pp. 178-184.

Samuel Wendell Williston, 1852-1918. *Journ. Geol.,* Vol. xxvi, pp. 673-689.

Theodore Roosevelt, Naturalist. *Nat. Hist.,* Vol. xix, pp. 9, 10.

[As President.] Fiftieth Annual Report of the Trustees of the American Museum of Natural History for the Year 1918. 237 pp.

[Review.] Zoologica. Scientific Contributions of the New York Zoological Society. Vol. I, 1907-1915. *Science,* N. S., Vol. xlix, No. 1277, June 20, 1919, pp. 592-594.

Samuel Wendell Williston—The Man and the Paleontologist. *Sigma Xi Quart.,* Vol. vii, pp. 2-6.

The Congo Expedition of the American Museum of Natural History—Introduction. *Bull. Amer. Mus. Nat. Hist.,* Vol. xxxix, pp. xv-xxvii.

Seventeen Skeletons of Moropus; Probable Habits of this Animal. *Proc. National Acad. Sci.,* Vol. v, pp. 250-252.

Palaeomastodon, the Ancestor of the Long-Jawed Mastodons Only. *Proc. National Acad. Sci.,* Vol. v, pp. 265, 266.

New Titanotheres of the Huerfano. *Bull. Amer. Mus. Nat. Hist.,* Vol. xli, Art. xv, pp. 557-569, 7 figs.

Characters and Restoration of the Sauropod Genus Camarasaurus Cope—From Type Material in the Cope Collection in the American Museum of Natural History. (With Charles Craig Mook.) *Proc. Amer. Phil. Soc.,* Vol. lviii, pp. 386-396, pl. i.

1920

Reconstruction of the Skeleton of the Sauropod Dinosaur, Camarasaurus Cope (Morosaurus Marsh). (With Charles Craig Mook.) *Proc. National Acad. Sci.,* Vol. v, pp. 15-18.

Sequoia—the Auld Lang Syne of Trees. . . . *Nat. Hist.,* Vol. xix, pp. 599-612.

[As President.] Fifty-first Annual Report of the Trustees of the American Museum of Natural History for the Year 1919. 259 pp.

Proposed Educational Tax in New York. *School and Soc.,* Vol. ix, pp. 589-591.

Renewal of Our Relations with the Scientific Men of Europe. *Science,* N. S., Vol. li, No. 1327, June 4, 1920, pp. 567, 568.

Fourth Year of the Tropical Research Station. *Science,* N. S. Vol. li, No. 1328, June 11, 1920, pp. 585-587.

Scientific Work in the Hawaiian Islands. *Science,* N. S., Vol. li, No. 1329, June 18, 1920, pp. 613, 614.

The Elliot Medal. *Science,* N. S., Vol. li, No. 1330, June 25, 1920, pp. 629, 630.

The Hall of the Age of Man in the American Museum. *Guide Leaflet* No. 52, *Amer. Mus. Nat. Hist.*

Nature in the Schools—Inspiration, Visual Instruction, Observation, Learning. [Foreword to "Free Nature Education . . ." by George H. Sherwood.] *Miscel. Pub. Amer. Mus. Nat. Hist.,* No. 13, pp. 5, 6.

1921

The Evolution, Phlogeny, and Classification of the Proboscidea. *Amer. Mus. Novitates,* No. 1, 15 pp.

Resemblances and Contrasts between Zoologic and Palæontologic Research in Mammalogy. Desirability of Uniform Standards and Systems in Classification, in Description, in Measurement, in Reasoning. *Journ. Mammal.,* Vol. ii, pp. 1-11.

Camarasaurus, Amphicœlias, and Other Sauropods of Cope. (With Charles Craig Mook.) *Mem. Amer. Mus. Nat. Hist.,* N. S., Vol. iii, pp. 247-387, pls. lx-lxxxv.

[As President.] Fifty-second Annual Report of the Trustees of the American Museum of Natural History for the Year 1920. 265 pp.

Third Award of the Daniel Giraud Elliot Medal. *Science,* N. S., Vol. liii, No. 1377, May 20, 1921, pp. 480, 481.

First Appearance of the True Mastodon in America. *Amer. Mus. Novitates,* No. 10, 6 pp.

The First Appearance of the True Mastodon in America. *Science,* N. S., Vol. liv, No. 1388, Aug. 5, 1921, p. 108.

Heads of African Elephants—Disparity in Size between That of the Male and That of the Female. *Nat. Hist.,* Vol. xxi, pp. 244, 245.

The Evolution, Phylogeny, and Classification of the Mastodontoidea. *Bull. Geol. Soc. Amer.,* Vol. xxxii, pp. 327-332.

Objects of the Tropical Research Station. *Zoologica,* Vol. iii, pp. 3-11.

Eugenics—The American and Norwegian Programs. *Science,* N. S., Vol. liv, No. 1403, Nov. 18, 1921, pp. 482-484.

The American Society of Naturalists. *Science,* N. S., Vol. liv, No. 1406, Dec. 9, 1921, p. 576.

Adaptive Radiation and Classification of the Proboscidea. *Proc. National Acad. Sci.,* Vol. vii, pp. 231-234.

Joel Asaph Allen, 1838-1921—An Appreciation. *Nat. Hist.,* Vol. xxi, pp. 513-515.

1922

Search for the Record of Robert Hanham Collyer, M.D. *Science,* N. S., Vol. lv, No. 1412, Jan. 20, 1922, p. 72.

The Lost Foxhall Jaw: Robert Hanham Collyer. *Science,* N. S., Vol. lv, No. 1414, Feb. 3, 1922, p. 128.

The Pliocene Man of Foxhall in East Anglia. *Nat. Hist.,* Vol. xxi, pp. 565-576.

The Dawn Man of Piltdown, Sussex. *Nat. Hist.,* Vol. xxi, pp. 577-590.

William Bateson on Darwinism. *Science,* N. S., Vol. lv, No. 1417, Feb. 24, 1922, pp. 194-197.

The Fifth Year of the Tropical Research Station. *Science,* N. S., Vol. lv, No. 1419, Mar. 10, 1922, pp. 254, 255.

[As Chairman.] Report of the Roosevelt Memorial Commission. *State of New York, Legislative Document,* (1922), No. 48, 25 pp.

The Birth of Sculpture in Southern France. *Nat. Hist.,* Vol. xxii, pp. 27-41.

Hesperopithecus, the First Anthropoid Primate Found in America. *Amer. Mus. Novitates,* No. 37, 5 pp., 3 figs.

[As President.] Fifty-third Annual Report of the Trustees of the American Museum of Natural History for the Year 1921. 259 pp.

Palæontology. *Encyclopædia Britannica* (12th ed.), Vol. xxxii (N. S., Vol. iii), pp. 9-16, pls. i, ii.

Orthogenesis as Observed from Paleontological Evidence Beginning in the Year 1889. *Amer. Naturalist,* Vol. lvi, pp. 134-143.

Our Ancestors Arrive in Scandinavia. *Nat. Hist.,* Vol. xxii, pp. 116-134.

Nature and Religion. *The Churchman,* Vol. cxxv, pp. 12, 13.

Species of American Pleistocene Mammoths, Elephas jeffersonii, New Species. *Amer. Mus. Novitates,* No. 41, 16 pp., 12 figs.

Brittany Four Thousand Years Ago. *Nat. Hist.*, Vol. xxii, pp. 197-212.

Recent Discoveries on the Antiquity of Man. (With Chester A. Reeds.) *Proc. National Acad. Sci.*, Vol. viii, pp. 246, 247.

Hesperopithecus, the Anthropoid Primate of Western Nebraska. *Nature*, Vol. 110, No. 2756, Aug. 26, 1922, pp. 281-283, 2 figs.

Discovery of Cretaceous and Older Tertiary Strata in Mongolia. *Science*, N. S., Vol. lvi, No. 1446, Sept. 15, 1922, pp. 291-293.

Pliocene (Tertiary) and Early Pleistocene (Quaternary) Mammalia of East Anglia, Great Britain, in Relation to the Appearance of Man. *Geol. Mag.*, Vol. lix, pp. 433-441, folding table.

Dibelodon edensis (Frick) of Southern California, Miomastodon of the Middle Miocene, New Genus. *Amer. Mus. Novitates*, No. 49. 4 pp.

Migrations and Affinities of the Fossil Proboscideans of Eurasia, North and South America, and Africa. *Amer. Naturalist*, Vol. lvi, pp. 448-455.

Close of the Age of Mammals. (With H. E. Anthony.) *Journ. Mammal.*, Vol. iii, pp. 219-237.

Old and New Standards of Pleistocene Division in Relation to the Prehistory of Man in Europe. (With Chester A. Reeds.) *Bull. Geol. Soc. Amer.*, Vol. xxxiii, pp. 411-490, 14 figs.

1923

Publication Standards in Vertebrate Palaeontology. *Proc. Biol. Soc. Washington*, Vol. xxxv, pp. 1-16.

Mastodons of the Hudson Highlands. *Nat. Hist.*, Vol. xxiii, pp. 3-24, frontispiece.

The Inspiration of the Teacher. *School and Soc.*, Vol. xvii, p. 379.

[As President.] Fifty-fourth Annual Report of the Trustees of the American Museum of Natural History for the Year 1922. 263 pp.

Baluchitherium grangeri. A Giant Hornless Rhinoceros from Mongolia. *Amer. Mus. Novitates*, No. 78, 15 pp., 9 figs.

Twenty-eight Years of Zoological Society Accomplishment. *27th Ann. Rept. N. Y. Zool. Soc.*, pp. 7-25.

The Extinct Giant Rhinoceros, Baluchitherium, of Western and Central Asia. *Nat. Hist.*, Vol. xxiii, pp. 208-228.

Field Explorations of the American Museum During the Year 1922. *Science*, N. S., Vol. lvii, No. 1485, June 15, 1923, pp. 681-683.

Ancient Fauna of Mongolia Discovered by the Third Asiatic Expedition of the American Museum of Natural History. *Science*, N. S., Vol. lvii, No. 1487, June 29, 1923, pp. 729-732.

Evolution and Religion. 12mo, Charles Scribner's Sons, New York, 21 pp.

Titanotheres and Lophiodonts in Mongolia. *Amer. Mus. Novitates*, No. 91, 5 pp., 2 figs.

A New Genus and Species of Ceratopsia from New Mexico, Pentaceratops sternbergii. *Amer. Mus. Novitates*, No. 93, 3 pp., 1 fig.

Cadurcotherium from Mongolia. *Amer. Mus. Novitates,* No. 92, 2 pp.
Two Lower Cretaceous Dinosaurs of Mongolia. *Amer. Mus. Novitates,* No. 95, 10 pp., 5 figs.
The Explorations of the American Museum of Natural History in China and Mongolia. *Proc. Amer. Phil. Soc.,* Vol. lxii, pp. 90-94.
New Subfamily, Generic and Specific Stages in the Evolution of the Proboscidea. *Amer. Mus. Novitates,* No. 99, 4 pp.
Linnean Classification and Phylogenetic Classification of the Proboscidea. *Palaeontologia Hungarica,* Vol. i, pp. 35-54.

1924

The Significance of Recent Discoveries in Mongolia. *China Journ. Sci. and Arts,* Vol. ii, pp. 39-43.
Discoveries During the Season of 1923 by the Third Asiatic Expedition in Mongolia. *Proc. National Acad. Sci.,* Vol. x, pp. 23, 24.
The Approach to the Immigration Problem Through Science. *Proc. National Immigration Conference. Special Report* No. 26, pp. 44-53.
Joseph Leidy, Founder of Vertebrate Palaeontology in America. *Science,* N. S., Vol. lix, No. 1521, Feb. 22, 1924, pp. 173-176.
The Discovery of an Unknown Continent. *Nat. Hist.,* Vol. xxiv, pp. 133-149.
Leidy and Marsh. (Reply to Charles Schuchert.) *Science,* N. S., Vol. lix, No. 1531, May 2, 1924, p. 399.
[As President.] Fifty-fifth Annual Report of the Trustees of the American Museum of Natural History for the Year 1923. 269 pp.
American Men of the Dragon Bones. Personal Impressions of a Field Trip to Mongolia with the Third Asiatic Expedition. *Nat. Hist.,* Vol. xxiv, pp. 350-365.
Psittacosaurus and Protiguanodon: Two Lower Cretaceous Iguanodonts from Mongolia. *Amer. Mus. Novitates,* No. 127, 16 pp., 9 figs.
Sauropoda and Theropoda of the Lower Cretaceous of Mongolia. *Amer. Mus. Novitates,* No. 128, 7 pp., 7 figs.
Asiatic Expeditions of the American Museum of Natural History. *Nature,* Vol. 114, No. 2866, Oct. 4, 1924, pp. 504-507.
Introduction to "Fossil Man in Spain," by Hugo Obermaier. 8vo, Hispanic Soc. of Amer., New York, pp. ix-xv.
Three New Theropoda, Protoceratops Zone, Central Mongolia. *Amer. Mus. Novitates,* No. 144, 12 pp., 8 figs.
Eudinoceras, Upper Eocene Amblypod of Mongolia. *Amer. Mus. Novitates,* No. 145, 5 pp., 2 figs.
Andrewsarchus, Giant Mesonychid of Mongolia. *Amer. Mus. Novitates,* No. 146, 5 pp., 3 figs.
Cadurcotherium ardynense, Oligocene, Mongolia. *Amer. Mus. Novitates,* No. 147, 4 pp., 3 figs.
Serridentinus and Baluchitherium, Loh Formation, Mongolia. *Amer. Mus. Novitates,* No. 148, 5 pp., 2 figs.

The Elliot Medal for 1924. *Science,* N. S., Vol. lx, No. 1561, Nov. 28, 1924, p. 95.

Parelephas in Relation to Phyla and Genera of the Family Elephantidae. *Amer. Mus. Novitates,* No. 152, 7 pp.

Additional Generic and Specific Stages in the Evolution of the Proboscidea. *Amer. Mus. Novitates,* No. 154, 5 pp.

[As Chairman.] Report and Recommendations of the Roosevelt Memorial Commission. *State of New York, Legislative Document* (1925), No. 40, 27 pp.

1925

The Elephants and Mastodons Arrive in America. *Guide Leaflet* No. 62, *Amer. Mus. Nat. Hist.*

The Daniel Giraud Elliot Medal. *Science,* N. S., Vol. lxi, No. 1581, April 17, 1925, pp. 410, 411.

[As President.] Fifty-sixth Annual Report of the Trustees of the American Museum of Natural History for the Year 1924. 305 pp.

Enduring Recollections [of Thomas Henry Huxley]. *Nature,* Supplement to Vol. 115, No. 2897, May 9, 1925, pp. 726-728.

The Origin of Species as Revealed by Vertebrate Paleontology. *Science,* N. S., Vol. lxi, No. 1585, May 15, 1925, pp. 23, 24.

Reminiscences of Huxley. *North Amer. Review,* Vol. ccxxi, pp. 654-664.

The Origin of Species as Revealed by Vertebrate Palaeontology. *Nature,* Vol. 115, No. 2902, June 13, 1925, pp. 925, 926; No. 2903, June 20, 1925, pp. 961-963.

The Earth Speaks to Bryan. 12mo, Charles Scribner's Sons, New York, 91 pp.

Evolution and Education in the Tennessee Trial. *Science,* N. S., Vol. lxii, No. 1594, July 17, 1925, pp. 43-45.

Final Conclusions on the Evolution, Phylogeny and Classification of the Proboscidea. *Proc. Amer. Phil. Soc.,* Vol. lxiv, pp. 17-35.

Extinct Rhinoceroses of North China. *Nat. Hist.,* Vol. xxv, pp. 522, 523.

Upper Eocene and Lower Oligocene Titanotheres of Mongolia. *Amer. Mus. Novitates,* No. 202, 12 pp.

Mammals and Birds of the California Tar Pools. *Nat. Hist.,* Vol. xxv, pp. 527-543.

The Origin of Species, II.—Distinctions Between Rectigradations and Allometrons. *Proc. National Acad. Sci.,* Vol. xi, pp. 749-752.

1926

[As Chairman.] Annual Report of the Roosevelt Memorial Commission, 1925. *State of New York, Legislative Document* (1926), No. 47, 2 pp.

How to Teach Evolution in the Schools. *School and Soc.,* Vol. xxiii, No. 576, Jan. 9, 1926, pp. 25-31.

The Evolution of Human Races. *Nat. Hist.,* Vol. xxvi, pp. 3-13.

Evolution and the University of Nebraska. *Science,* N. S., Vol. lxiii, No. 1625, Feb. 19, 1926, p. 209.

The Origin of Species, 1859-1925. *Bull. 1, Peabody Mus. Nat. Hist.,* pp. 25-38.

[As Chairman.] The Daniel Giraud Elliot Medal. *Science,* N. S., Vol. lxiii, No. 1630, March 26, 1926, pp. 329, 330.

[As President.] Fifty-seventh Annual Report of the Trustees of the American Museum of Natural History for the Year 1925. 269 pp.

Why Central Asia? *Nat. Hist.,* Vol. xxvi, pp. 263-269.

The Problem of the Origin of Species as it Appeared to Darwin in 1859 and as it Appears to Us Today. *Nature,* Vol. 118, No. 2964, Aug. 21, 1926, pp. 270-273.

Evolution and Religion in Education. Polemics of the Fundamentalist Controversy of 1922 to 1926. 8vo, Charles Scribner's Sons, New York, pp. xiii, 240.

Discoveries in the Gobi Desert by the American Museum Expeditions. *Nature,* Vol. 118, No. 2968, Sept. 20, 1926, pp. 418-420.

Evolution III—The Palaeontological Aspect. *Encyclopædia Britannica* (13th ed.). New Vol. I [New Form, Vols. 29-30], pp. 1073-1075.

[Palæontology.] Mongolia, Palaeontologic Discoveries in. *Encyclopædia Britannica* (13th ed.). New Vol. II [New Form, Vols. 29-30], pp. 940-944.

The Problem of the Origin of Species as it Appeared to Darwin in 1859 and as it Appears Today (A Correction). *Nature,* Vol. 118, No. 2973, Oct. 23, 1926, pp. 591, 592.

Modern Aspects of Evolution. [Review of "Nomogenesis: or Evolution Determined by Law," by Prof. Leo S. Berg.] *Nature,* Vol. 118, No. 2974, Oct. 30, 1926, pp. 617, 618.

La protection de la Grande Faune au Congo Belge. *Bull. Cercle Zool. Congolaise,* Vol. iii, pp. 37-41.

Additional New Genera and Species of the Mastodontoid Proboscidea. *Amer. Mus. Novitates,* No. 238, 16 pp., 12 figs.

A Contemporary of Charles Darwin. *Science,* N. S., Vol. lxiv, No. 1669, Dec. 24, 1926, pp. 623, 624.

1927

Creative Education in the School. *School and Soc.,* Vol. xxv, pp. 55-60.

The Origin of Species, V—Speciation and Mutation. *Amer. Naturalist,* Vol. lxi, pp. 5-42.

J. L. Wortman—A Biographical Sketch. *Nat. Hist.,* Vol. xxvi, pp. 652, 653.

[As Chairman.] Second Annual Report of the Board of Trustees of the New York State Roosevelt Memorial, 1926. *State of New York, Legislative Document* (1927), No. 51, 8 pp.

[As President.] Fifty-eighth Annual Report of the Trustees of the American Museum of Natural History for the Year 1926. 300 pp.

Recent Discoveries Relating to the Origin and Antiquity of Man. *Science,* N. S., Vol. lxv, No. 1690, May 20, 1927, pp. 481-488.

The Origin of Man; a Correction. *Science,* N. S., Vol. lxv, No. 1694, June 17, 1927, p. 597.

The Story of the Bear in the First Printing of Darwin's "Origin of Species." *Science,* N. S. Vol. lxv, No. 1695, July 24, 1927, p. 616.

History of the Earth. *Nat. Hist.,* Vol. xxvii, p. 297.

Fundamental Discoveries of the Last Decade in Human Evolution. *Bull. N. Y. Acad. Medicine,* (2), Vol. iii, pp. 513-521.

Creative Education in School, College, University and Museum. 8vo, Charles Scribner's Sons, New York, pp. viii, 360.

Recent Discoveries in Human Evolution. *Long Island Medical Journ.,* Vol. xxi, pp. 563-567.

Recent Discoveries Relating to the Origin and Antiquity of Man. *Palaeobiologica,* Vol. i, pp. 189-202.

Man Rises to Parnassus. 8vo, Princeton University Press, pp. xx, 217, and plates.

1928

History, Plan and Design of the New York State Roosevelt Memorial. Oblg. 4to., 19 pp., vi pls.

[As Chairman.] Third Annual Report of the Board of Trustees of the New York State Roosevelt Memorial 1927. *State of New York, Legislative Document,* (1928), No. 96, 9 pp.

[Reply to Count Costantini on reception of diploma from Italian Institute of Human Palæontology.] *Eugenical News,* Vol. xiii, pp. 26, 27.

The Vanishing Wild Life of Africa. *Nat. Hist.,* Vol. xxvii, pp. 515-524.

The Influence of Habit in the Evolution of Man and the Great Apes. *Bull. N. Y. Acad. Med.,* (2), Vol. iv, pp. 216-230.

The Influence of Bodily Locomotion in Separating Man from the Monkeys and Apes. *Sci. Monthly,* Vol. xxvi, pp. 385-399.

Mammoths and Man in the Transvaal. *Nature,* Vol. 121, No. 3052, April 28, 1928, pp. 672, 673.

[As President.] Fifty-ninth Annual Report of the Trustees of the American Museum of Natural History for the Year 1927. 308 pp.

Louis Agassiz and the Hall of Fame. *Science,* N. S., Vol. lxvii, No. 1743, May 25, 1928, p. 523.

The Plateau Habitat of the Pro-Dawn Man. *Science,* N. S., Vol. lxvii, No. 1745, June 8, 1928, pp. 570, 571.

Researches and Publications of the Princeton University Expeditions to Patagonia 1896-1899. (Review.) *Science,* N. S., Vol. lxvii, No. 1745, June 8, 1928, p. 575.

Present Status of the Problem of Human Ancestry. *Proc. Amer. Phil. Soc.,* Vol. lxvii, pp. 151-155.

Joel Asaph Allen. In "Dictionary of American Biography," Vol. i.

1929

[As Chairman.] Fourth Annual Report of the Board of Trustees of the New York State Roosevelt Memorial. *State of New York, Legislative Document,* (1929), No. 59, 12 pp.

The Revival of Central Asiatic Life. *Nat. Hist.,* Vol. xxix, pp. 3-16.

Bashford Dean. *Nat. Hist.,* Vol. xxix, pp. 102, 103.

Note on the Geological Age of Pithecanthropus and Eoanthropus. *Science,* N. S., Vol. lxix, No. 1782, Feb. 22, 1929, pp. 216, 217.

Is the Ape-Man a Myth? *Human Biology,* Vol. i, pp. 4-9.

[As President.] Sixtieth Annual Report of the Trustees of the American Museum of Natural History for the Year 1928. 180 pp.

Thomas Jefferson, the Pioneer of American Palæontology. *Science,* N. S., Vol. lxix, No. 1790, Apr. 19, 1929, pp. 410-413.

Embolotherium Gen. Nov., of the Ulan Gochu, Mongolia. *Amer. Mus. Novitates,* No. 353, 20 pp., 11 figs.

Charles Depéret. *Science,* N. S., Vol. lxix, No. 2799, June 21, 1929, pp. 636, 637.

Address of Welcome (to Geological Society of America). *Bull. Geol. Soc. Amer.,* Vol. xl, pp. 79, 80.

Sir E. Ray Lankester, K.C.B., F.R.S. *Nature,* Vol. 124, No. 3122, Aug. 31, 1929, pp. 345, 346.

Interruption of Central Asiatic Exploration by the American Museum of Natural History. *Science,* N. S., Vol. lxx, No. 1813, Sept. 27, 1929, p. 291-294.

Paleontological Monographs of the National Geological Surveys. *Science,* N. S., Vol. lxx, No. 1814, Oct. 4, 1929, pp. 315-317.

Howard Crosby Butler. In "Dictionary of National Biography," Vol. iii.

Ancient Migration Routes of Central Asia. *Science,* N. S., Vol. lxx, No. 1826, Dec. 27, 1929, pp. 638, 639.

The Miocene Gibbon of France and Germany. *Nat. Hist.,* Vol. xxix, p. 670.

New Eurasiatic and American Proboscideans. *Amer. Mus. Novitates,* No. 393, 23 pp., 22 figs.

The Titanotheres of Ancient Wyoming, Dakota, and Nebraska. *Monograph 55, U. S. Geol. Surv.* 2 Vols., 4to, Government Printing Office, Washington.

[As Chairman.] Fifth Annual Report of the Trustees of the New York State Roosevelt Memorial . . . 1929. *State of New York, Legislative Document,* (1930), No. 56, 14 pp.

1930

The Discovery of Tertiary Man. *Science,* N. S., Vol. lxxi, No. 1827, Jan. 3, 1930, pp. 1-7.

The Bermuda Oceanographic Expedition. *N. Y. Zool. Soc. Bull.,* Vol. xxxiii, p. 35.

[As President.] Sixty-first Annual Report of the Trustees of the American Museum of Natural History for the Year 1929. 217 pp.

Biographical Memoir of Edward Drinker Cope, 1840-1897. *Biographical Memoirs, National Acad. Sci.,* Vol. xiii, pp. 125-317.

Renewal of the American Museum Exploration in the Gobi Desert. *Science,* N. S., Vol. lxxi, No. 1845, May 9, 1930, pp. 481-482.

Address . . . The Sixtieth Anniversary of the Founding of the [Metropolitan] Museum. *Bull. Metropolitan Mus. Art,* Vol. xxv, Section II, pp. 6, 7.

The Ancestry of Man. *Nature,* Vol. 125, No. 3159, May 17, 1930, p. 745.

Influence of the Glacial Age on the Evolution of Man. *Bull. Geol. Soc. Amer.,* Vol. xl, pp. 589-595.

Palæontology Versus Genetics. *Science,* N. S., Vol. lxxii, No. 1853, July 4, 1930, pp. 1-3.

A New Method of Deep Sea Observation at First Hand. *Science,* N. S., Vol. lxxii, No. 1854, July 11, 1930, pp. 27, 28.

Fifty-two Years of Research, Observation and Publication, 1877-1929. 8vo, Charles Scribner's Sons, New York, pp. xii, 160.

Ancient Vertebrate Life of Central Asia. In "Livre Jubilaire publié à l'occasion du Centenaire de la Société Géologique de France, 1830-1930," pp. 529-543.

The Inspiration of Nature. *Nat. Hist.,* Vol. xxx, p. 451.

Preface to Volume III of the Bulletin of the Vanderbilt Marine Museum. *Bull. Vanderbilt Marine Mus.,* Vol. iii, p. 3.

Parelephas floridanus from the Upper Pleistocene of Florida Compared with P. jeffersoni. *Amer. Mus. Novitates,* No. 443, 17 pp., 9 figs.

1931

New Conceptions of Species and Genera, and of Classification, Discovered in the Evolution of the Titanotheres. *Journ. Mammal.,* Vol. xii, pp. 1-11.

[As Chairman.] Sixth Annual Report of the Board of Trustees of the New York State Roosevelt Memorial . . . 1930. *State of New York, Legislative Document,* (1931), No. 56, 17 pp.

Coryphodonts of Mongolia, Eudinoceras mongoliensis Osborn, E. kholobolchiensis sp. nov. *Amer. Mus. Novitates,* No. 459, 13 pp., 11 figs.

Palæoloxodon antiquus italicus sp. nov., Final Stage in the Elephas antiquus Phylum. *Amer. Mus. Novitates,* No. 460, 24 pp., 17 figs.

The Shovel-Tuskers, Amebelodontinæ, of Central Asia. (With Walter Granger.) *Amer. Mus. Novitates,* No. 470, 12 pp., 3 figs.

Cope: Master Naturalist. (With the cooperation of Helen Ann Warren.) 8vo, Charles Scribner's Sons, New York, pp. xvi, 740.

[As President.] Sixty-second Annual Report of the Trustees of the American Museum of Natural History for the Year 1930. 208 pp.

Palæontology versus De Vriesianism and Genetics in the Factors of the Evolution Problem. *Science,* N. S., Vol. lxxiii, No. 1899, May 22, 1931, pp. 547-549.

George Fisher Baker—1840-1931. *Nat. Hist.,* Vol. xxxi, pp. 328, 329.

Memorial of William Diller Matthew (with complete bibliography). *Bull. Geol. Soc. Amer.,* Vol. xlii, pp. 55-95.

The Lower Pleistocene Age of Peking Man. *Nat. Hist.,* Vol. xxxi, p. 446.

The Elephant Enamel Method of Measuring Pleistocene Time. Also Stages in the Succession of Fossil Man and Stone Age Industries. (With Edwin H. Colbert.) *Proc. Amer. Phil. Soc.,* Vol. lxx, pp. 187-191.

Arrest of Geologic, Archeologic and Paleontologic Work in Central Asia. *Science,* N. S., Vol. lxxiv, No. 1910, Aug. 7, 1931, pp. 139-142.

Explorations, Researches and Publications of Pierre Teilhard de Chardin, 1911-1931. *Amer. Mus. Novitates,* No. 485, 13 pp., map.

Lindsay Morris Sterling. *Nat. Hist.,* Vol. xxxi, p. 563.

Creative Science Teaching. *Progressive Education,* Vol. viii, pp. 468, 469.

The Principles of Evolution Revealed by Palæontology. *Nature,* Vol. 128, No. 3239, Nov. 28, 1931, pp. 894-897.

New Concept of Evolution Based upon Researches on the Titanotheres and the Proboscideans. *Science,* N. S., Vol. lxxiv, No. 1927, Dec. 4, 1931, pp. 557-559.

[As Chairman.] Seventh Annual Report of the Board of Trustees of the New York State Roosevelt Memorial . . . 1931. *State of New York, Legislative Document,* (1932), No. 56, 24 pp.

1932

The Nine Principles of Evolution Revealed by Palæontology. *Amer. Naturalist,* Vol. lxvi, pp. 52-60.

[As President.] Sixty-third Annual Report of the Trustees of the American Museum of Natural History for the Year 1931. 205 pp.

Platybelodon grangeri, Three Growth Stages, and a New Serridentine from Mongolia. (With Walter Granger.) *Amer. Mus. Novitates,* No. 537, 13 pp., 8 figs.

Coryphodonts and Uintatheres from the Mongolian Expedition of 1930. (With Walter Granger.) *Amer. Mus. Novitates,* No. 552, 16 pp., 18 figs.

Birth Selection versus Birth Control. *Science,* N. S., Vol. lxxvi, No. 1965, Aug. 26, 1932, pp. 173-179.

The "Elephas meridionalis" Stage Arrives in America. *Proc. Colorado Mus. Nat. Hist.,* Vol. xi, No. 1, 5 pp., 2 figs.

Trilophodon cooperi, sp. nov., of Dera Bugti, Baluchistan. *Amer. Mus. Novitiates,* No. 585, 6 pp., 2 figs.

Biological Inductions from the Evolution of the Proboscidea. *Science,* N. S., Vol. lxxvi, No. 1979, Dec. 2, 1932, pp. 501-504.

1933

Recent Revivals of Darwinism. *Science*, N. S., Vol. lxxvii, No. 1991, Feb. 24, 1933, pp. 199-202.

[As Chairman.] Eighth Annual Report of the Board of Trustees of the New York State Roosevelt Memorial, 1932. *State of New York, Legislative Document*, (1933), No. 71, 24 pp.

[As President.] Sixty-fourth Annual Report of the Trustees of the American Museum of Natural History for the Year 1932. 130 pp.

Des principes qui ont présidé à l'évolution biomécanique des Mammifères. *Comptes rendus, Acad. Sci.* (Paris), t. 196, No. 24, pp. 1760-1763.

Serbelodon burnhami, a New Shovel-tusker from California. *Amer. Mus. Novitates*, No. 639, 5 pp., 2 figs.

Aristogenesis, the Observed Order of Biomechanical Evolution. *Proc. National Acad. Sci.*, Vol. xix, pp. 699-703.

Mounted Skeleton of Triceratops elatus. *Amer. Mus. Novitates*, No. 654, 14 pp., 5 figs.

Welcome to the International Geological Congress. *Science*, N. S., Vol. lxxviii, No. 2022, Sept. 29, 1933, pp. 274, 275.

Aristogénèse, le nouveau principe inductif d'évolution biomécanique. *Revue Générale Sci.*, t. xliv, pp. 495-505.

1934

Senescent hypotheses as to the nature and causes of evolution. *Science*, N. S., Vol. lxxix, No. 2052, April 27, 1934, p. 376.

[As Chairman.] Ninth Annual Report of the Board of Trustees of the New York State Roosevelt Memorial, 1933. *State of New York, Legislative Document*, (1934), No. 88, 19 pp.

Aristogenesis, the Creative Principle in the Origin of Species. *Amer. Naturalist*, Vol. lxviii, pp. 193-235.

The National Academy of Sciences . . . Presentation of the Daniel Giraud Elliot Medal and Honorarium for 1931 to the late Dr. Davidson Black. *Science*, N. S., Vol. lxxix, No. 2060, June 22, 1934, pp. 553, 554.

Evolution and Geographic Distribution of the Proboscidea: Moeritheres, Deinotheres and Mastodons. *Journ. Mammal.*, Vol. xv, pp. 177-184.

Primitive Archidiskodon and Palaeoloxodon of South Africa. *Amer. Mus. Novitates*, No. 741, 15 pp., 5 figs.

The Thirty-nine Distinct Lines of Proboscidean Descent, and their Migration into all Parts of the World except Australia. *Proc. Amer. Phil. Soc.*, Vol. lxxiv, pp. 273-285.

The Dual Principles of Evolution. *Science*, N. S., Vol. lxxx, No. 2087, Dec. 28, 1934, pp. 601-605.

1935

The Ancestral Tree of the Proboscidea. Discovery, Evolution, Migration, and Extinction Over a 50,000,000 Year Period. *Proc. National Acad. Sci.*, Vol. xxi, pp. 404-412.

Thomas Jefferson as a Paleontologist. *Science,* N. S., Vol. lxxxii, No. 2136, Dec. 6, 1935, pp. 533-538.

1936

Amynodon mongoliensis from the Upper Eocene of Mongolia. *Amer. Mus. Novitates,* No. 859, 5 pp., 2 figs.

Proboscidea. A Monograph . . . Vol. I, Mœritherioidea, Deinotherioidea, Mastodontoidea. 4to, pp. xl, 802, xii pls., 680 text figs. *The American Museum of Natural History.*