

FOSSIL VERTEBRATES IN THE AMERICAN MUSEUM OF NATURAL HISTORY.

IN May 1891, the American Museum of Natural History began to form its historical collection of the Fossil Vertebrates of North America. The new department of Vertebrate Palæontology was established for this purpose, and the Curator organised a series of expeditions to different formations in the Rocky Mountain region, beginning with the older tertiaries, and mainly under the direction in the field of Dr. J. L. Wortman, the well-known collector and investigator. Between 1891 and 1897 twenty distinct expeditions have been sent out, in several instances the same regions being revisited two or three times, with the object of securing complete material of certain types. In 1894 and 1895, and upon a larger scale in 1897, the explorations were extended into the Mesozoic rocks for fossil reptiles. But the main strength of the work hitherto has been among the fossil mammals, and the Eocene and Oligocene collections are now especially complete, embracing the remains of 3000 individuals determined stratigraphically with accuracy, and establishing several new sub-horizons of great importance. In 1895 the famous series of mammalian fossils brought together by the late Prof. Cope was added to these collections, embracing types of 555 species and upwards of 6000 individual specimens.

There are many sides of this work of interest to the vertebrate palæontologist, but we may describe here only the effort which has been made to secure for the Museum complete skeletons of the most typical forms in different geological periods. To every one familiar with the rarity of the older Tertiary types, the difficulty of this undertaking will be at once apparent. It is very seldom indeed that a complete skeleton like that of *Phenacodus* is found together in the older rocks. In ninety-nine cases out of a hundred, the skeletons are largely or wholly dissociated. Another difficulty is, that in the rare cases of association the skeletons are apt to be severely crushed beyond the possibility of reconstruction. In such cases only a drawing can be made. Despite all this the Museum has succeeded by persistent attacks upon one horizon after another, and by superior methods of field work, in securing a very representative series of complete skeletons partly belonging to single individuals,

in some types to three or four different individuals, and in other types, as in the skeleton of *Teleoceras*, to a very large number of individuals. With the arrival in the Museum of this material in the crude condition from the field have arisen the mechanical problems of mounting

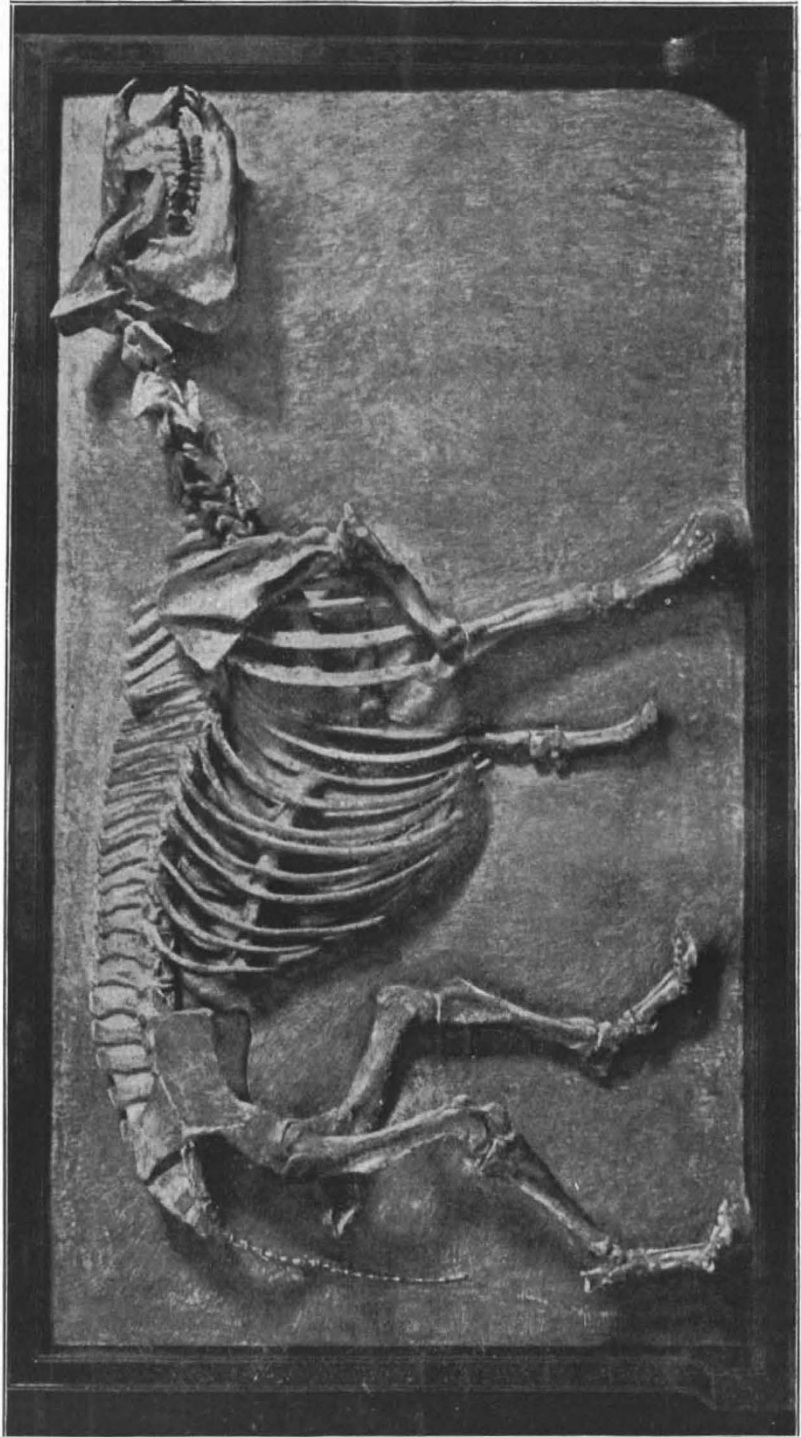


FIG. 1.—*Aceratherium tridactylum*, hornless rhinoceros from the Upper Oligocene of South Dakota. High relief mounting of a single laterally crushed skeleton.

these skeletons in various ways. This has received prolonged study, and after numerous experiments and some failures has now reached a high degree of perfection.

It was at first believed impossible to mount a stone or fossilised skeleton free like a recent skeleton, and the

These reliefs, however, have the disadvantage of practically burying one side of the animal, and thus rendering many parts both immovable and difficult of access for purposes of study. In other words, the exhibition purpose too far supersedes the purely scientific and research purpose. An entire departure was therefore made in the skeletons of the swimming rhinoceros, *Metamynodon*, and of the great Titanotherium, both from the Oligocene.

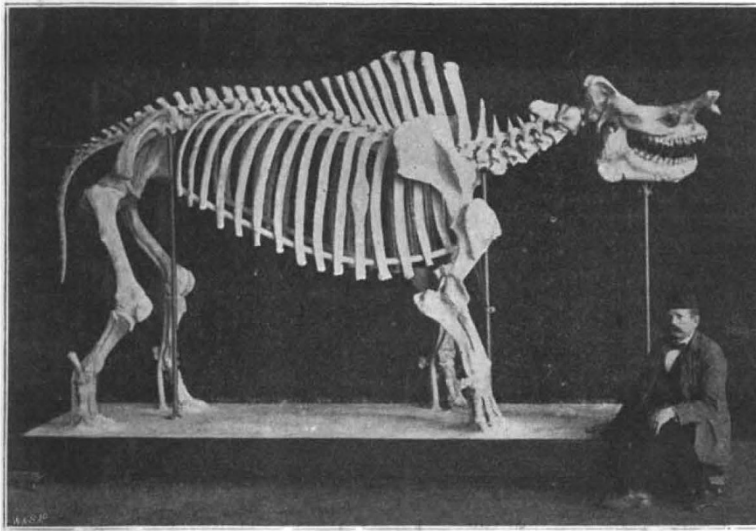


FIG. 2.—*Titanotherium robustum*, skeleton of one of the largest species, female. From the Lower Oligocene of South Dakota.

first experiments upon a large Creodont or primitive Carnivore, *Patriofelis*, the bones were placed in high relief upon a background of matrix resembling the original rock in which the specimen was found. This method was also adopted in the skeleton of *Aceratherium tridactylum* (Fig. 1), which happened to be very much crushed laterally, and was therefore peculiarly fitted for mounting in relief. The result, as shown in the photograph, was highly successful. This skeleton, which is entirely original except the left fore limb, conveys to the visitor the idea of having been literally hewn out of the rock,

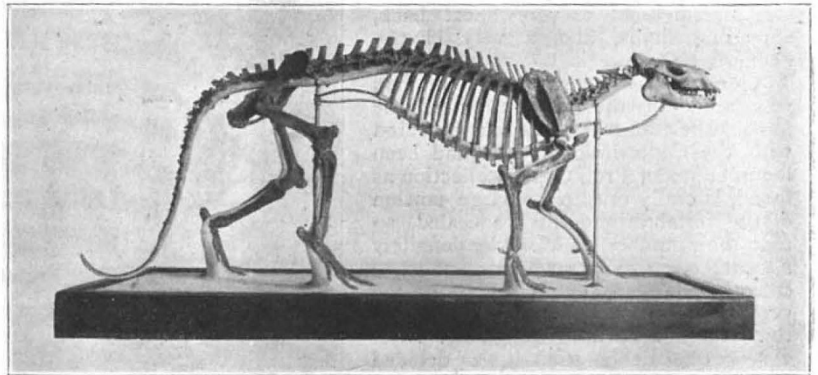


FIG. 4.—*Phenacodus primaevus*, the typical specimen. From the Lower Eocene of Wyoming, Big Horn Mountains.

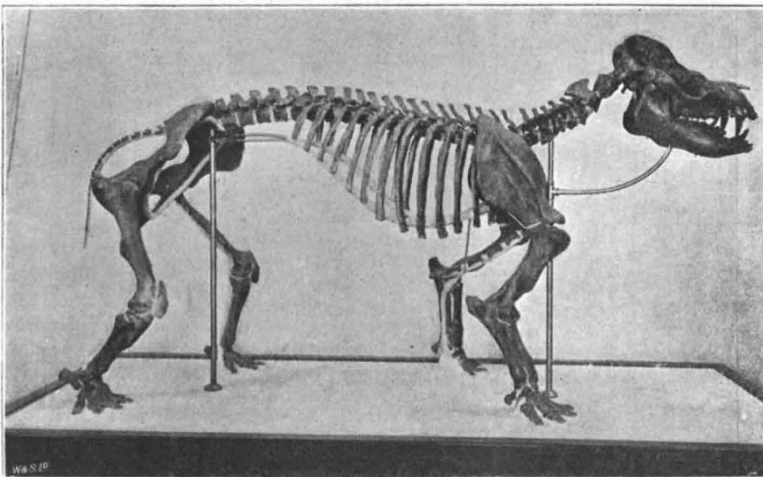


FIG. 3.—*Coryphodon testis*, skeleton of a large male. From the Lower Eocene of Wyoming, Big Horn Mountains.

high, with habits rather like those of the hippopotamus than rhinoceros. In the same year, 1892, the fortunate discovery was made of a magnificent Titanotherium skeleton in South Dakota. The skull was first found in a somewhat fragmentary condition, and then the neck, entire trunk and fore limb, perfect even to the sesamoids, were excavated as far back as the last lumbar vertebra and the border of one ilium. At this point there was a great disappointment—the party encountered a sudden change in the rock, and found that the sacrum, the remainder of the hip and hind limbs had been carried away by an erosion which had probably occurred at some time after the original deposition of the entire animal. It required the work of two parties during the season of 1894 to secure the bones of the hind quarters of proper proportion belonging to the same species. The mounting method adopted, as fairly shown in the photo-

and thus the two-fold impression of age and of fossilisation is at once given.

graph (Fig. 2) consists in carrying steel rods upon the inner sides of the limbs and arches, to connect with a main rod

which passes through the neural canal, this in turn being supported by two heavy uprights. The weight of this skeleton is enormous, yet it can be moved about without the least danger. It is perfectly rigid, and every part can be freely reached for purposes of study. As completed it stands about 14 feet long, 8 feet high, and 4 feet broad.

Another skeleton, mounted by a substantially similar method, belongs to the very rare animal *Coryphodon* (Fig. 3). This was also laboriously brought together after three separate expeditions to New Mexico and Wyoming, the complete remains being finally found upon a level in the Bad Lands adjoining the Big Horn River in northern Wyoming. It represents a number of different individuals, but there is no question that the remains belong to one species, and are of a fully adult type. In general one is struck with the very large size of the head, upon which can be seen swellings prophetic of the posterior horns of *Uintatherium*, the formidable tusks, heavy girdles, powerful fore limb bent out at the elbow, and a semi-plantigrade or sub-digitigrade step. Other peculiar features are the shortness of the spines and the shortness of the ribs. It is shown that *Coryphodon* had a very short back, spreading limbs, and a very clumsy shuffling gait.

A decided advance upon this method was made in the remounting of the famous skeleton of *Phenacodus* procured with the Cope direction. It had been mounted under Prof. Cope's collection as found, laterally crushed, a large portion of the vertebræ and ribs concealed, so that their number could not be definitely ascertained, and in such position as to convey a false impression both of the proportions and mode of locomotion of this remarkably primitive ungulate. After very careful deliberation, it was decided to remove the skeleton entirely from the matrix, and remount it as nearly as possible in the natural position. This removal cost many months of labour, and two months more were occupied by Mr. Hermann, preparator, in setting up the animal as represented in the photograph (Fig. 4). In the course of the removal of the stone and plaster matrix the two missing cervical vertebræ were found inserted in the tail, and the number of ribs was definitely ascertained to be fifteen on each side, thus positively determining the dorsal vertebral formula—a matter of very great importance. These results alone justified the labour and expense involved, and the mount is now a model of its kind, since it not only displays the real anatomical character and natural position of the animal, but every bone on one side of the body or the other can be removed for purposes of detailed study. It strikes us as a rather slenderly built, straight-limbed animal, digitigrade like the tapir, five-toed, but almost exclusively supported upon three toes. Sir William Flower's restoration, in his volume upon the Horse, is very nearly correct; the upwardly arched back, powerful lumbar vertebræ, long hind quarters and long powerful tail,

when contrasted with the much shorter fore quarters, rather low withers and small head, are all reminiscent of the clawed ancestry of this hoofed animal.

Of much more recent age is the skeleton of *Teleoceras*

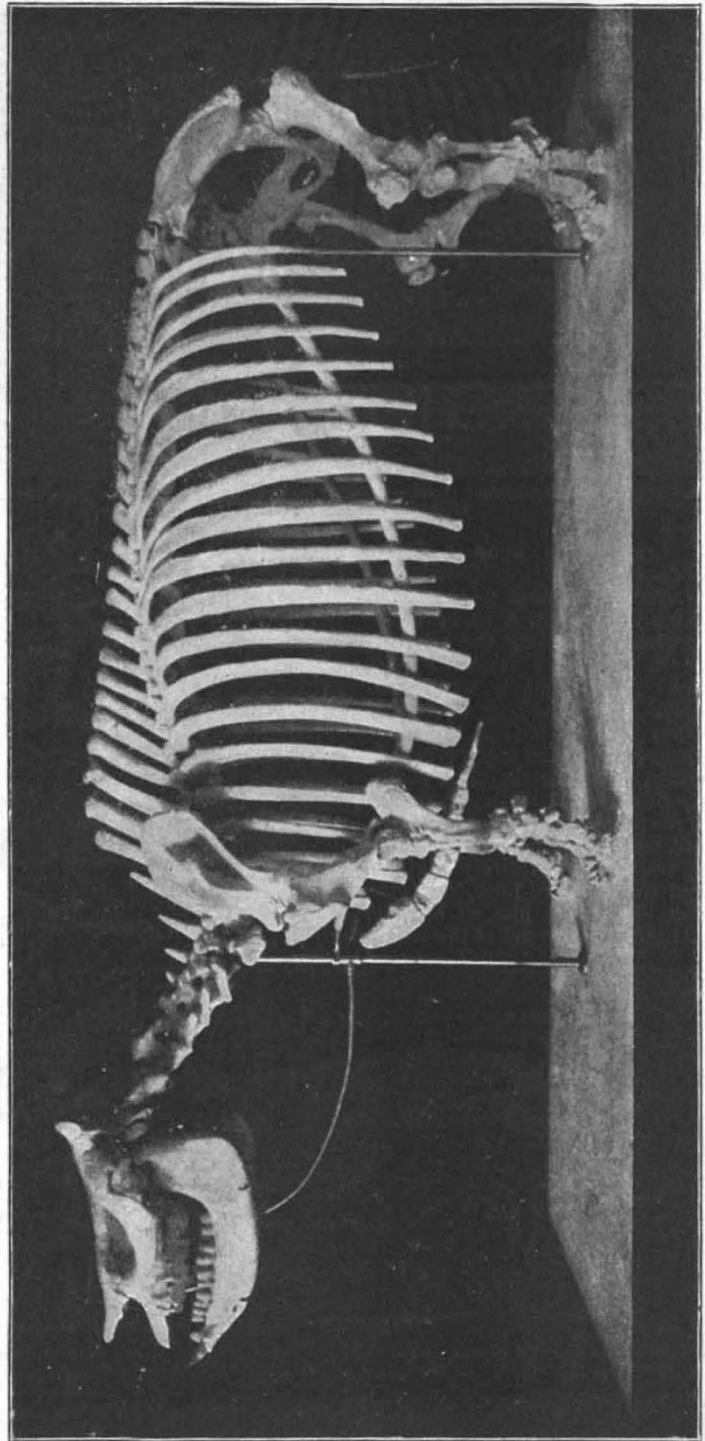


FIG. 5.—*Teleoceras fossiger*, female rhinoceros with a small terminal nasal horn. From the Upper Miocene of Northern Kansas.

fossiger, a feebly horned rhinoceros living in great numbers at the top of the Miocene. This animal represents an aged female, of very large size, mounted from materials belonging to probably twenty individuals,

which were secured in Northern Kansas in the autumn of 1894 (Fig. 5). It comes from the famous quarry which has supplied several museums with more or less complete collections. From various accounts, and especially from our own observations, it appears that this quarry represents an old bone bed, probably the deposit of some stream or small river, along which the rhinoceroses herded in great numbers. Our party secured here over 400 complete bones, representing mingled remains of both sexes and of all sizes. Only in certain spots was the proximity of one specimen to another found to be a proof of association. By careful study of such occasional associations and selection of bones representing only the largest and oldest individuals, a skeleton was gradually brought together, which is believed to represent very nearly the correct proportions of this exceptional type. The dimensions are: length, 10 feet 2 inches; height at withers, 4 feet 1 inch; and greatest girth, 9 feet 2 inches. It thus appears that from head to tail *Teleoceras fossiger* was only six inches shorter than *Rhinoceros unicornis*, while the back is 18 inches nearer the ground. This remarkable lowering of the trunk is chiefly caused by the great reduction of the fore-arm, fore-leg, and metapodials. The abdominal girth exceeds that of the Indian rhinoceros, justifying Cope's assertion that this animal had rather the proportions of the hippopotamus than of the existing rhinoceros. Osborn and Scott undertook a restoration of the skeleton of this animal in 1890, but did not venture to give the ribs their full length, as they far exceeded those of any existing form. The length of rib as here shown is, however, beyond question. By comparison of this mount with those preceding, it will be seen that it presents a very marked advance in the method of mechanical construction. The only visible supports are the vertical uprights and the horizontal pieces holding the ribs. All the remaining supports are of steel, and consist of rods which traverse the centre of the various bones, even of the delicately arched ribs, and are thus entirely concealed. This method, which appears to be the most perfect of its kind, would be, however, impracticable in skeletons coming from the older Eocene rocks, which are composed of very much denser material.

Altogether there are now thirteen mounted skeletons exhibited in the Museum, and fifteen others are in various stages of preparation.

HENRY F. OSBORN.

NOTES.

WE have been asked by Prof. Meldola, the Hon. Organising Secretary to the Sylvester Memorial, to state that this Fund has now been closed, the subscriptions amounting altogether to over 890*l*. The capital sum has been invested by Lord Rothschild, the Treasurer of the Fund, on behalf of the subscribers, and the dividends will be transmitted to the Treasurer of the Royal Society. The engraving of the dies has been entrusted to Mr. John Pinches, and it has been decided that the material of the medal shall be bronze, that the award shall be triennial and irrespective of nationality, and that the recipient of the medal shall receive the accumulated (triennial) interest of the Fund, after deducting the cost of striking the medal. An autotype print of the medal will be presented to the subscribers by Prof. J. M. Peirce (of Harvard University) as soon as the dies have been engraved.

THE Geological Society of London will this year award its medals and funds as follows:—The Wollaston Medal to Prof. Charles Lapworth; the Murchison Medal to Mr. B. N. Peach, and a second Murchison Medal to Mr. John Horne; the Lyell Medal to Lieut.-General C. A. McMahon; the Bigsby Medal to

Prof. T. W. Edgeworth David; the Wollaston Fund to Prof. J. B. Harrison; the Murchison Fund to Mr. James Bennie; the Lyell Fund is divided between Mr. Frederick Chapman and Mr. John Ward.

THE Institution of Electrical Engineers has made the following awards for papers read during the session 1897-98:—The Institution Premium to Mr. Horace F. Parshall, for his paper on earth returns for electric tramways. The Paris Electrical Exhibition Premium to Mr. Robert Hammond for his paper on the cost of generation and distribution of electrical energy. The Fahie Premium was not awarded because no telegraphic or telephonic papers had been read during the session. Extra Premium to Mr. Leonard Andrews, for his paper on the prevention of interruptions to electricity supply. Premium for original communications, to Mr. H. N. Allen, for his paper on sparkless reversal in dynamos. Students Premiums were awarded to Mr. J. M. Donaldson for his paper on the Dover electric tramways; Mr. Maurice Solomon, for his paper on Hertz waves and wireless telegraphy; and Mr. E. E. Tasker, for his paper on alternate current motors. Salomons Scholarships were awarded to Mr. Tom Rolls Renfree, King's College, London, and Mr. H. J. Tomlinson, University College, London.

A SHORT account of the recent celebration of the centenary of the St. Petersburg Military Medical Academy is given in the current number of the *Lancet*. The celebration commenced on December 30, 1898, when the congratulatory addresses of the presidents were presented. On Sunday, January 1, a visit was paid to the large non-military hospital associated with the Imperial Academy and to the Physical Laboratory, over which the delegates were shown by Dr. Danilevsky, who exhibited many experiments with liquid air, and demonstrated an apparatus by Zeiss by means of which images of small opaque bodies could be perfectly reproduced upon the lecturer's blackboard or screen. The chief part of Monday, January 2, was spent in a tour of inspection through the immense establishment on the islands at which all the instruments, splints, dressings, and apparatus are made for the army. On Wednesday, January 4, a miniature review was held by the Czar in an enormous riding school, and on its conclusion the delegates had the honour of being presented one by one to his Imperial Majesty. The British representatives were Rev. H. S. Cronin, Mr. Cross, Dr. Ferguson, Prof. Ogston, Mr. Owen, and Prof. Shipley. Throughout the entire series of functions the Minister of War showed by his presence that he deemed the Army Medical Department of real importance to his country. He expressed considerable pleasure at receiving congratulatory remarks from his visitors. It evidently gave him particular satisfaction to read out at the banquet before 500 guests a congratulatory telegram which arrived from the German Emperor.

THE *Lancet* states that on the occasion of the recent jubilee of the St. Petersburg Academy of Medicine, the following British men of science have been appointed honorary members of the Academy:—Sir William MacCormac, Bart.; Sir William Turner, Lord Rayleigh, Sir William Stokes, Dr. William MacEwen, and Drs. Thompson and Lauder Brunton.

PROF. CHANTEMESSE, of the Pasteur Institute, Paris, has been promoted to the grade of Officer of the Legion of Honour.

PROF. ALEXANDER G. R. FOULERTON has been appointed bacteriologist to the Middlesex Hospital.

PROF. POINCARÉ has been nominated president of the French Bureau des longitudes, M. Faye, vice-president, and Prof. Lippmann, secretary.