POEBROTHERIUM.

F. B. LOOMIS.

In the summer of 1927 the Amherst College Expedition, working in the Oligocene near Hat Creek, Wyoming, found a skeleton of *Poebrotherium wilsoni*. When taken from the matrix this showed so many points of difference from the classical conception of this early camel, that it seems desirable to review our knowledge of the Oligocene camels, in order to make a more accurate picture of this important form, and to distinguish more clearly the four known species.

The genus *Poebrotherium* was established by Leidy in 1847,[1] when he gave the name *P. wilsoni* to the first vertebrate specimen sent in by Mr. Alexander Culbertson from the Bad Lands of South Dakota. The type is an imperfect skull with the milk teeth still in place, but all the molars erupted. In 1881[2] Cope in an article on foot structure names another larger species, *P. labiatum*. Scott in 1891[3] gives a detailed description of the osteology of the genus and presents the first restoration of the skeleton of the whole animal. This is based on "the larger part of a skeleton belonging to one individual," which seems to be the same material as that on which Cope based his species *P. labiatum*. It consists of the skull, the cervical vertebrae, part of the dorsal and lumbar vertebrae and the hind limb. The rest of the restoration is made by taking data from other individuals. It is from this restoration of the skeleton that the flesh restorations, so familiar to every student of vertebrate palaeontology, have been made. Certain questions were at that time left open, such as the vertebral formula, the number of the ribs and their length.

The specimen found last summer lay in the matrix fully articulated from the skull through the sacrum, and with the limbs still in articulation. It was exposed from the right side and the lower parts of the right front leg and the right hind leg were weathered away; but both of the limbs on the left side were complete as were the ribs. There are seven cervical vertebrae, 13 dorsals, and 7 lumbars. The delicate ribs

[1] Proc. Acad. Nat. Sci., Philadelphia, 3, p. 322.
[2] Amer. Naturalist, 15, p. 269.
[3] Jour. Morphology, 5, p. 1.

were taken out by first exposing the inner side and then gluing to each a strip of cloth, so that when removed, though fractured, each was complete and its length and width were preserved beyond a doubt. An extra skull was found with the skeleton and this had an even more perfect dentition than the one articulated to the backbone.

The first striking feature of the skeleton as it lay in the rock was the high arch of the backbone, in contrast to Scott's restoration which has the back nearly flat as in the living

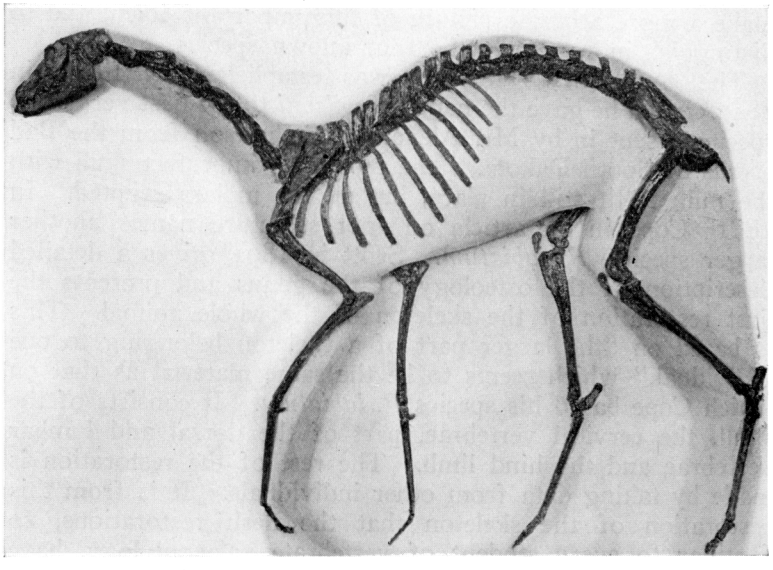

Fig. 1. The skeleton of *Poebrotherium wilsoni*. About 1/10 natural size. It measures 29½ inches high from the highest part of the back to the feet.

guanaco. Though we took the vertebrae apart and expected to make a low arched back, they would not articulate, except as the back was considerably arched. Then too in spite of having one more vertebra than in the Scott restoration the whole back is shorter than in previous restorations. Another striking feature which came out at once was that the fore limbs are short as compared with the hind limbs, which again coincides with the arched back.

Fig. 1 is a photograph of the new specimen (27-41 of the

Amherst Museum) which gives a new, and I believe more accurate, idea of *Poebrotherium*. It is an animal less like the typical modern camels such as the guanaco, and more like a gazelle in outline. Instead of walking flat-footed on a pad, I believe *Poebrotherium* (and also the Miocene genera like *Oxydactylus, Stemomylus,* and *Protolabis*) walked on the tips of its toes as does the deer. This is indicated by the articular surface of the metapodials not extending so far to the front as in modern camels; and by the fact that the last phalynx is not reduced, but is full sized and with sharp angles on the sides. The flat foot and straight back are later acquisitions taken on at the time the camels adapted themselves to desert life sometime in the Pliocene.

There has not been a comparative study of the species of *Poebrotherium* and there is a considerable amount of confusion in the determinations in various museums. This shows especially in the paper by Wortman on the "Extinct Camolidae of North America,"[4] where he figures a skull *P. wilsoni,* which Hay, when making his catalogue of Fossil Vertebrates of North America, recognized as belonging to another species, and so proposed for it the name *P. eximium.* Considerably later Troxell[5] found a very perfect skull of a *Poebrotherium* which is peculiar in having the upper canine reduced in size and the third upper incisor enlarged. To this he gave the name *P. andersoni.* Aside from the peculiarity mentioned it is similar to *P. labiatum.* This makes four species so far described.

The Amherst parties have collected *P. wilsoni* and *P. labiatum* from the same bed in eastern Wyoming, a skeleton of each and several skulls. *P. labiatum* differs in having a considerable gap between pm. 1 and pm. 2 while *P. wilsoni* has a shorter gap. *P. labiatum* is supposed to be about 10% larger. However we have found specimens of *P. labiatum* that were actually smaller than *P. wilsoni* and in no two is the interval between pm. 1 and pm. 2 the same. There is wide variation both in the spacing of these teeth and in their size. In fact the size and shape of the premolars and incisors is extremely variable. The result of looking over the Amherst material, that of the American Museum and some from other museums leads me to the conclusion that the difference between these two species is not

[4] Bul. Amer. Museum Nat. Hist., 10, 110, 1898.
[5] This Journal, 43, 381, 1917.

more than sex differentiation. *P. labiatum* seems to be the male, while *P. wilsoni* is the female, the differences being either sex, age or individual. As to *P. andersoni* it may be noted that the dentition taken to illustrate the upper teeth of *P. labiatum* has the third incisor enlarged and the canine reduced (Fig. 2 D). This is not as marked as in the type of *P. andersoni* (Fig. 2 C) but is the beginning of the same sort of thing.

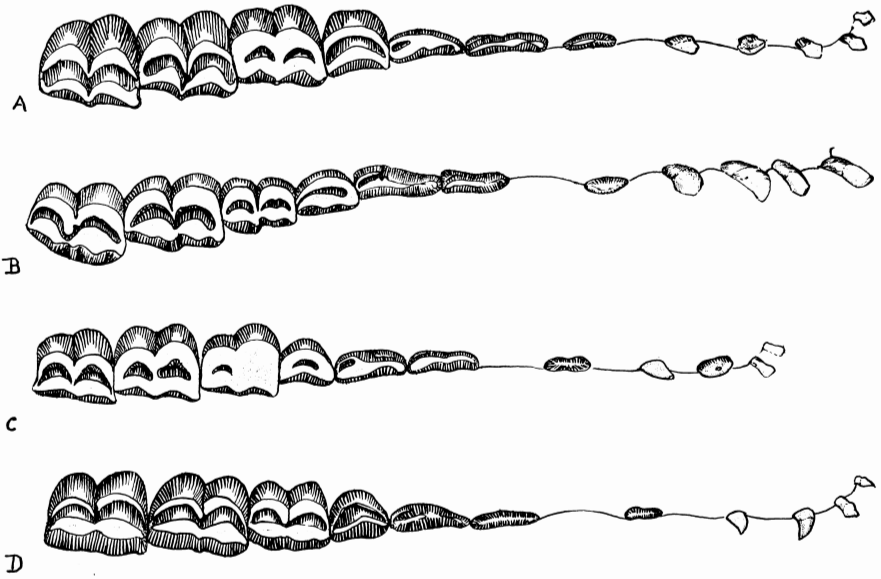

Fig. 2. The upper dentitions of the four species of *Poebrotherium*. A—*P. eximium*, B—*P. wilsoni*, B—*P. andersoni*, D—*P. labiatum*. Natural size.

The type of *P. andersoni* comes from the same beds as those in which we collected *P. wilsoni* and *P. labiatum*. In the original descriptions this species is compared mostly with *P. eximium*, but it is very close to *P. labiatum*. The type of *P. labiatum* is incomplete in the canine and incisor region, so we have no means of comparing it with the type. However, I have seen specimens of *P. labiatum* with the canine larger than the third incisor, equal in size, and with the canine much smaller than the third incisor. The type of *P. andersoni* is an extreme case in this respect but I cannot see in it anything justifying a separate species. *P. eximium* has an almost closed dentition and comes from the lowest beds of the middle Oligo-

cene and may well be regarded as a separate species. The anterior portion of the dental series in *Poebrotherium* is extremely variable and for any one of the three species *(P. wilsoni, P. labiatum,* and *P. andersoni)* there are specimens grading into the next species so completely as to make it impossible to draw a line between the species, and all occur in the same bed. I therefore feel that in these species and in others which could be established on equally good grounds, we are

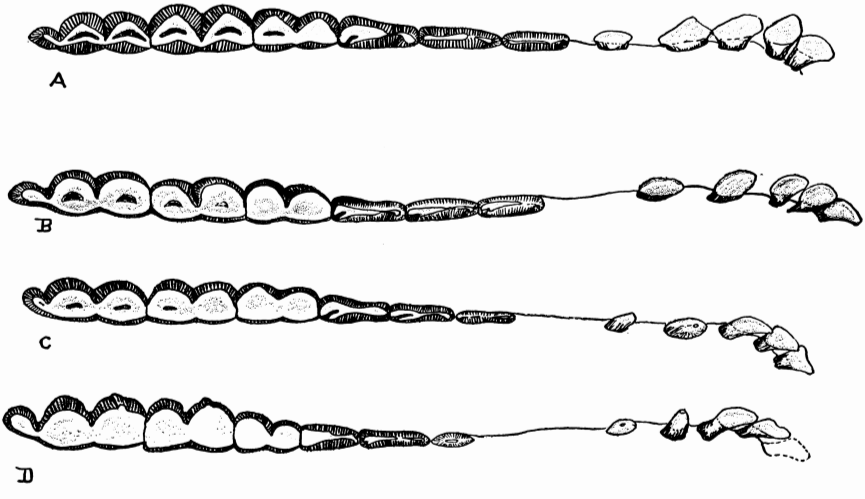

Fig. 3. Lower dentitions of the same four species in the same order.

dealing with the normal variation due to sex, age and individuality. This conclusion is confirmed by looking at a series of modern guanaco skulls. Here also is found a wide range of variation in the development of the premolar and incisor teeth. It seems to be characteristic of the family to have considerable differences in the size and spacing of these anterior teeth.

That the differences which have been used to distinguish species in *Poebrotherium* may be readily seen, I have made comparative drawings of the four species which have been described, using the types in the case of *P. eximium* and *P. andersoni,* and for the other two species the best skull available, as the types do not have the anterior portions of the skulls preserved.

Poebrotherium has been several times referred to as an abundant fossil. Though the writer has collected in the middle Oligocene parts of at least ten seasons he can by no means call it a common type of artiodactyl. By going over several collections I find that *Poebrotherium* represents about 5% of the finds of mammals; so is to be thought of as one of the rarer animals and by no means a dominant form. The occurrences are relatively abundant in the following order, *Merycoidodon (Oreodon), Mesohippus, Hyracodon, Leptomeryx* and then *Poebrotherium.* In the Miocene beds the representatives of the camel family become relatively more dominant.

AMHERST COLLEGE,
AMHERST, MASS.