

The feet are primitive in type, and were apparently digitigrade, yet the terminal phalanges were not encased in hoofs or in claws, but possessed an intermediate character, which has suggested the ordinal name. Their extremities are thin, somewhat expanded, and more like those of Primates than of any other group. They were apparently covered by thin nails.

The femur has a third trochanter, near the middle of the shaft. The tibia resembles that of a carnivore. The fibula is complete, well developed, and at its distal end is expanded, and meets both the astragalus and the calcaneum.

The hind foot is represented in figure 2, and presents several points of interest. The astragalus and calcaneum are very similar to those in Rodents. The navicular is supported entirely by the astragalus, and the cuboid by the calcaneum. On the tibial side below the navicular, and supported by it, is a small bone (*x*) having beneath it the entocuneiform. It meets the middle cuneiform also. This bone has apparently not been known hitherto, and may be called the epicuneiform. It may, perhaps, correspond to what is known as the tibial sesamoid in Rodents and Carnivores, but its position and connection in the present tarsus are quite different. Moreover, a distinct tibial sesamoid is also present inside and behind the epicuneiform, and hence not shown in the figure.

In the feet of *Meniscotherium*, there are five well-developed digits in manus and pes. The structure of the carpus and tarsus agrees in general with that of *Hyracops*, but in some points, there appear to be differences of importance.

The order *Mesodactyla* contains at present the two genera *Meniscotherium* and *Hyracops*, which include primitive mammals of small size, having the full number of forty-four teeth in continuous series, with the premolars and molars similar in type to mammals known as Ungulates. The limbs and feet are primitive in type, unlike those of any known Ungulates, and resemble those of Carnivores, or the early Primates.

This order stands in somewhat the same relation to the typical Ungulates that the *Tillodontia* do to Rodents, and the *Chalicotheria** to Edentates. Very briefly defined, the *Mesodactyla* may be considered as having the ungulate type of dentition, with the limbs and feet of early Primates; the *Chalicotheria* as combining an ungulate dentition with the feet of Edentates; while the *Tillodontia* unite with the rodent dentition the extremities of primitive Carnivores. These three orders are quite distinct from each other and from the remain-

* The name first proposed for this order, *Chalicotheroidea*, Gill, 1872, may appropriately be shortened to *Chalicotheria*. The term *Ancylopoda* more recently given is preoccupied. The genus *Moropus* is not identical with *Chalicotherium* as has been stated, and *Morotherium*, which has also been referred to the latter genus, is a true Edentate allied to *Myiodon*.

ing *Mammalia*. All three have certain points of resemblance, but differ widely in other respects. Their exact relations to each other and to other mammals are still uncertain, but future discoveries may at any time clear the matter up.

One fact is becoming more and more evident, the near affinity of the early Primates, Carnivores, Ungulates, and Rodents, with each other and with the Insectivores, and more remotely with Marsupials. The key to the mystery lies concealed in the great break between the lower Wahsatch, at the base of the Eocene as now known, and the Laramie beds of the Cretaceous. In the latter, none of the above placental mammals have been found, but in the early Eocene occur, side by side, Carnivores, Rodents, and Ungulates, the last represented by both typical Perissodactyles and Artiodactyles, and even some of their subdivisions. The *Amblydactyla* of large size, the *Tillodontia* also large, and the diminutive *Mesodactyla*, all apparently lived together in this period, and a comparison of their special characters points out their probable lines of descent. The convergence of these lines makes every discovery in the earlier geological horizons of importance, and a connection with the Mesozoic *Mammalia* may at any moment be demonstrated. The Edentates are evidently a later development, as are also the Sirenians and Cetaceans.

New Haven, Conn., April 16, 1892.

ART. LVII.—Notice of New Reptiles from the Laramie Formation; by O. C. MARSH.

AMONG the extensive collections of vertebrate fossils secured during the last few years from the Ceratops beds along the eastern base of the Rocky Mountains, remains of reptiles largely predominate, and many have already been described by the writer. A number of new forms of much interest have recently been secured, and some of these are briefly noticed below. The presence of Ophidians and true Lacertilians among the gigantic forms of *Dinosauria* is especially noteworthy, as their discovery has long been expected. The new Dinosaurs described confirm previous indications, that this subclass, before its extinction, developed into many highly specialized forms, of which suggestions, at least, were seen in those from lower horizons. The large number and variety of these specialized forms could hardly have been anticipated, and they make prominent the probability that the Reptilian age reached its culmination near the close of the Cretaceous.

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Coniophis precedens, gen. et sp. nov.

The earliest serpents hitherto known in this country are included in the genera *Titanophis* (*Dinophis*) from the marine Eocene of New Jersey, and *Boavus* from the fresh-water Dinoceras and Coryphodon beds of the West, both described by the writer.* None have hitherto been found in the American Cretaceous, and but one species is known from Europe.† The type specimen of the present genus and species is the vertebra represented below in figure 1. Several others were found at the same locality, but may not pertain to this individual.

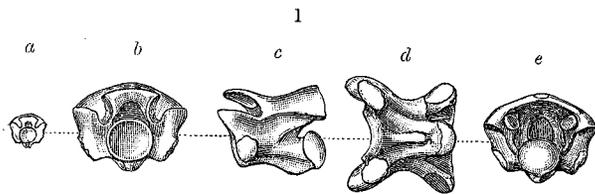


FIGURE 1.—Vertebra of *Coniophis precedens*, Marsh.
a, natural size; b, c, d, e, three times natural size.

In the type specimen figured above, the zygosphene articulation is fully developed, and all the characteristic Ophidian features are distinctly shown. The nearer affinities of the genus will be discussed in a later communication. All the known remains of the species are from the Ceratops beds of Wyoming.

Chamops segnis, gen. et sp. nov.

The type specimen of the present genus is the maxillary bone with teeth represented in figures 2 and 3 below. Various other parts of the skull and skeleton have been found at different localities in the same horizon, but it is not certain that they pertain to the same species. Dentary bones with precisely similar teeth, and corresponding in size with the jaws figured, have been secured, and there can be little doubt of their identity. Among the other portions of the skull obtained is the upper part of the cranium. This has the surface very rugose, and is perforated by a large parietal foramen.

* This Journal, vol. xlviii, p. 397, November, 1869; and vol. i, p. 322, May, 1871.
† Sauvage, Comptes Rendus, t. xci, p. 671, 1880.

Various vertebræ found at the same localities may be referred to this species. They are procelian, with the cup and ball transverse, and oblique. These are all without the zygosphene articulation.

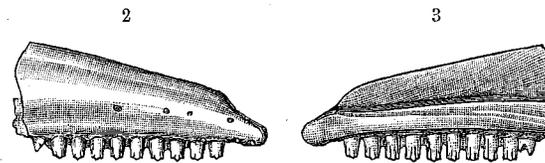


FIGURE 2.—Maxillary of *Chamops segnis*, Marsh; outer view.
FIGURE 3.—The same bone; inner view. Twice natural size.

The remains of the species here described are all from the Laramie of Wyoming.

Iguanavus teres, sp. nov.

Another Lacertilian, much smaller than the above, left its remains in the same horizon. The specimens best preserved are vertebræ, which agree in general form of the centra with those just described, but possess the zygosphene articulation. They are about the size of the Ophidian vertebra above described, but may readily be distinguished by the oblique and transversely expanded articular faces, and by the smooth under surface of the centrum. The type specimens are all from the Laramie of Wyoming.

Ornithomimus sedens, sp. nov.

The remarkable Dinosaurs described by the writer, and referred to the present genus, representing a distinct family, were mainly from fragmentary remains, but differed widely from all forms then known.* Since then explorations in the same horizon further north have brought to light various other specimens, which prove the group to be of great interest, but make it probable that they should be referred, not to the *Ornithopoda*, but to the *Theropoda*.

The present species is based upon the nearly complete pelvis, with various vertebræ, and some other parts of the skeleton. The most striking feature of the pelvis is the fact, that the ilium, ischium, and pubis are firmly coössified with each other, as in recent birds. This character has been observed

* This Journal, vol. xxxix, p. 84, January, 1890.

hitherto among Dinosaurs, only in the genus *Ceratopsaurus* described by the writer from the Jurassic of Wyoming.* The present pelvis resembles that of *Ceratopsaurus* in its general features, but there is no foramen in the pubis.

There are five vertebræ in the sacrum, firmly coössified with each other, as are also the sacral spines. The sacral vertebræ are grooved below, with the sides of the centra excavated. The caudals have the diplosphenal articulation, and the first caudal bears a chevron. All the bones preserved are very delicate, and some of them, at least, are apparently pneumatic. The sacrum measures fifteen inches in length, and the twelve caudals following occupy a space of thirty-one inches. The known remains indicate a reptile about eight or ten feet in length.

In the same horizon occur the remains of a very minute species, which agrees in all its characters, so far as determined, with the members of this genus. The most characteristic portions secured are the metatarsal bones, and these show the same features exhibited in the type species of the genus, *O. velox*. They are, however, so much smaller as to suggest that they may pertain to a bird. Various portions of the second, third, and fourth metatarsals are known, and the distinctive feature is seen in the third, which has the upper part of the shaft so attenuated that it may not reach to the tarsus. The second and fourth metatarsals are very long and slender. This unique fossil, when alive, was about the size of the common fowl. The species may be called *Ornithomimus minutus*.

The large species described by the writer as *Ornithomimus grandis* belongs in essentially the same horizon. Portions of two other skeletons have since been obtained, which apparently pertain to this species. In one of these, the femur, tibia, and fibula are in good preservation, and they clearly demonstrate that this reptile was one of the largest of the *Theropoda*. The femur and tibia have each a very large cavity in the shaft, with well-defined walls. Even the fibula has a cavity in its upper portion. In the other specimen, the second metatarsal is in fair preservation, and shows the same form as in the type of the genus.

There is much probability that this gigantic carnivore was one of the enemies of the *Ceratopsidæ*, and the discovery of the entire skull and skeleton will be awaited with interest, as they will doubtless show special features for offense, which the peculiar defensive armor of the *Ceratopsidæ* was designed to meet.

The known remains of all the above species are from the Ceratops beds of Wyoming.

*This Journal, vol. xxvii, p. 329, April, 1884.

Claosaurus annectens, sp. nov.

The reptiles of the Laramie allied to *Hadrosaurus* are numerous and highly specialized. One of the forms most distinct, but not abundant, is here described, and the type specimen is a nearly complete skull and skeleton. This will be fully described by the writer, but as the pelvis presents some points of interest it is represented in figure 4 below. The ilium exhibits no special characters of importance, and agrees in the main with the corresponding bone of the type of the genus. The ischium is especially elongated, and very straight. The pubis is represented by a very large, expanded prepubis, and a mere remnant of the postpubis, as is well shown in the figure.

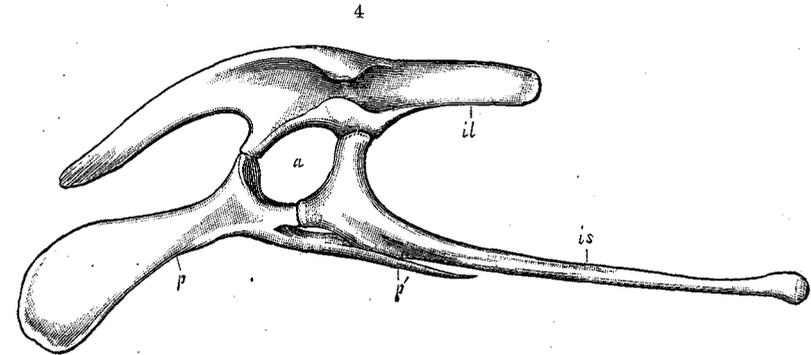


FIGURE 4.—Pelvis of *Claosaurus annectens*, Marsh. One sixteenth natural size. *a*, acetabulum; *il*, ilium; *is*, ischium; *p*, pubis; *p'*, postpubis.

This important specimen is from the Laramie of Wyoming.

The fossils described in the present article were all collected by Mr. J. B. Hatcher, whose discoveries in the Rocky Mountain region are well known to paleontologists.

New Haven, Conn., April 18, 1892.