Article II.—FOSSIL MAMMALS OF THE UINTA BASIN. EXPEDITION OF 1894.

By Henry Fairfield Osborn.

I.—Introductory Notes.

The mammalian life of the upper Eocene of North America is clearly recorded in four old lake basins, the northern or 'Wind River,' the west-central or 'Bridger,' the east-central or 'Washakie,' and the southern or 'Uinta.' The American Museum parties have now explored each of these four basins in succession, concluding with the Uinta exploration, which is the basis of this report.

This uppermost or latest of the Eocene lake sediments was made known by Marsh[1] in 1870. A fuller exploration of the Uinta by a party under Scott and Speir in 1886 resulted in the memoir, 'The Mammalia of the Uinta Formation,'[2] published in 1889 by Scott and Osborn. The American Museum sent Mr. O. A. Peterson into the Uinta in the autumn of 1893, but owing to restrictions upon the Uncompahgre Indian Reservation he was obliged to return after having secured only a few fossils. In the late summer and autumn of 1894, however, aided by Major Randlett, of Fort Duchesne, and by a permit from the Secretary of the Interior, Mr. Peterson was far more successful. He secured for the Museum a complete geological section along the White River, a collection representing about 150 fossil mammals, many of which are new, because his search was mainly in older and lower levels than those previously explored. A preliminary study of this fauna leads to the following results :

1.—General Results.

1. Beneath the true Uinta fauna is a distinct fauna transitional to the 'Washakie' and 'Bridger' of the east- and west-central basins. This contains undoubted horned ancestors of the Titan-

[1] 'On the Geology of the Eastern Uinta Mountains.' Am. Jour. Sci., 1871, p. 191–198.
[2] Trans. Am. Phil. Soc., May 17, 1889.

otheres, yet of an older type than *Diplacodon*, because the premolar teeth are simple. With these forms are found surviving members of the distinctively Bridger types, such as *Uintatherium*, also several forms which have hitherto only been found in Washakie, such as *Achænodon*. Still more surprising is the appearance upon this sub-Uinta level of species of *Elotherium* and *Hyænodon*, genera which have been considered of a distinctively Lower Miocene age.

Below this level is a still older fauna not yet fully explored, containing a number of typical Washakie forms, also a new type of large mammal, *Sphenocœlus*, apparently hitherto not known.

2. Species of *Telmatotherium* abound in the sediments of this sub-Uinta level, and confirm Earle's prediction that this genus was ancestral to the Titanotheres. No true *Palæosyops* has thus far been found. *Telmatotherium cornutum* is in one of the direct ancestral lines leading to the Titanotheres. It shows a flat cranium, very long nasals and small naso-frontal horns. It was anticipated by *T. vallidens* of the Washakie, with horns in a still more rudimentary stage.

3. The smaller fauna of the basin hitherto recorded is increased by a new rodent related to *Paramys*, and a new Monkey related to *Microsyops*.

4. The full characters of *Amynodon intermedius* are given by the complete skeleton of a young individual obtained in the true Uinta.

These results are so important, and give such large promise for the future, that the Museum has sent a party back into the Uinta for the third and more thorough exploration of 1895.

2.—Geology of the Uinta Basin.

Mr. O. A. Peterson contributes the following preliminary observations upon the geology of the Basin: "The Uinta Basin of northeastern Utah is bounded to the north by the Yampa and Uinta Mountains, to the west by the Wahsatch Mountains, and to the south and east by the Tavaputs Plateau and Book Cliffs. The

basin is drained through the centre by the Green River with its tributaries the White River of Utah on the east, and the Duchesne River on the west; these enter almost opposite one another near the Indian Agency of Ouray.

"1. As we enter the southeastern border of the basin overlooking Book Cliffs, some thirty miles south of White River, the *Wahsatch* or Coryphodon beds are met with, resting upon the Cretaceous, but as I did not explore this I cannot add anything to what is known as to the relations between the Laramie and Wahsatch sediment at this point. The entire sedimentary mass in this basin dips northwestwardly at an angle of about 8°, and is observed unconformably resting upon the upturned edges of Laramie, especially along the northern border of the basin.

"2. Conformably overlying the Wahsatch are the *Green River Shales*, identical in appearance with the corresponding series in the Bridger Basin, and attaining nearly the same thickness. As we cross the basin northwestwardly from Book Cliffs we reach the White River near the Colorado and Utah State line. Some forty miles west of its junction with Green River the White River cuts through the Tertiary rocks exposing cañons and vertical walls of sometimes 400 to 500 feet in thickness from the river bed to the top. Here we obtain fine stratigraphical sections.

"3. Conformably overlying the Green River shales is a series of *hard brown sandstones* of the same character as sandstones which are found capping these shales north of the Uinta Mountains. Alternating with this brown sandstone are clay layers of a greenish-gray color, and this whole series reaches a thickness of about 800 feet. Specimens were found in the sandstone ledges of this series which represent true Bridger types. Overlying this series is a well-marked stratum of a light reddish color about 20 to 40 feet thick. This is especially noticed in the eastern part of the basin where the most satisfactory stratigraphical sections can be obtained.

"4. The most important and faunally rich series of sediments in the Uinta basin immediately overlies and conformably succeeds the last mentioned reddish clay stratum. These beds are about

350 to 400 feet thick, and are composed of coarse brown sandstones with alternating clays. The largest part of the vertebrate collection secured by the party is from this level, and is of great interest owing to its transitional relationship between the true Bridger and the Uinta fauna.

"5. We now reach the *true Uinta*[1] or Brown's Park beds of a fine-grained soft material much the same in appearance as the characteristic Bad Lands of South Dakota, with the exception of the color which is of a brick red; in fact, the reddish tinge holds good throughout the entire Uinta sediment. At a distance these beds present a ferruginous aspect, and are about 600 feet thick. This uppermost strata of the Uinta Basin has hitherto been reported[2] as resting unconformably upon the underlying Bridger sediment, but no observable breaks were found to distinguish the true Uinta from the underlying Bridger sediment. So the writer found it necessary in collecting fossils to divide the beds overlying the Green River shales into three different levels, which are here arranged alphabetically in ascending position:

"Horizon *C.*—True Uinta beds 600 feet thick. Sandstones and clays brownish and reddish, ferruginous. The strata are sometimes evenly bedded and firm, but often irregular and friable, and present the characteristic Bad Land appearance where the erosion has been most complete. This is the level in which the Yale College and the Princeton expeditions have made their explorations, and it contains the true Uinta fauna.

"Horizon *B.*—300 feet thick. Soft coarse sandstones and clays.

"Horizon *A.*—800 feet thick. Hard brown sandstones immediately overlying the Green River Shales."

3.—The Three Faunal Levels.

These excellent observations supply one of the most important links in the American lake faunal chain, namely that between the

[1] King, U. S. Geological Exploration of the 40th Parallel, Map 1.
[2] Charles A. White, 'On the Geology and Physiography of a Portion of Northwestern Colorado and Adjacent Parts of Utah and Wyoming.' U. S. Geol. Survey, Ninth Annual Report, p. 690–1.

Washakie and the Uinta. The explorations of the present year, 1895, may modify these results, but it is certain we have now not only established a complete faunal transition from the Bridger and Washakie beds upon the one side, to the true Uinta level or Horizon *C* upon the other, but have demonstrated a closer connection between the fauna of this basin and that of the lowest White River Miocene.

SUCCESSION OF SPECIES IN THE UINTA BASIN.

(*Museum Catalogue Numbers.*)

HORIZON *C.*—UPPER LEVEL. *Diplacodon elatus beds.* About 600 feet. Brown and red sandstones and clays, ferruginous.	(Am. Mus. Exp., 1894.)—Mesonyx, 1505. Miacis uintensis, 1895. Diplacodon, 1853, 1853a, 1861–2. Amynodon intermedius, 1933; indet., 1934–5, 1506. Isectolophus annectens, 1827–8, 1927. Triplopus ? obliquidens, 1928. Epihippus ? uintensis, 1930. Protoreodon and Leptotragulus, 1800–18, 1826-a. Incertæ sedis, 1829, 1874. (Princeton Exp., 1886.)—Mesonyx uintensis, Hyopsodus gracilis, Plesiarctomys sciuroides, Leptotragulus proavus, Protoreodon parvus, Diplacodon elatus, Amynodon advenus, Miacis vulpinus.
HORIZON *B.*—MIDDLE LEVEL. *Telmatotherium cornutum beds.* About 350 feet. Soft coarse sandstones and clays.	Microsyops uintensis, 1899, 1900. Miacis uintensis, 1896. Mesonyx uintensis, 1892. ? M. obtusidens, 1891. ? Hyænodon, 1893–4. Paramys uintensis, 1901. Telmatotherium cornutum (skulls), 1845–52, 1837, 1868; (jaws), 1854–5, 1858–9. T. hyognathum, 1856. T. diploconum, 1863, ? 1870–1; (skeletons), 1831–44, 1860, 1869, 1872. Incertæ sed., 1864–7. Amynodon, 1932, 1936, 1830. Helaletes guyotii, 1829. Epihippus, 1930. Achænodon insolens, 1819, 1825. Elotherium uintense, 1820–24, 1826 b, c. Uintatherium, 1884–1890.
HORIZON *A.*—LOWER LEVEL. *Telmatotherium megarhinum beds.* About 800 feet. Hard brown sandstone.	Telmatotherium megarhinum, 1500, ? 1864–5, 1876, 1877. Amynodon, 1878. Triplopus, 1879. Indet., 1501–4, 1880. Uintatherium, 1881. Sphenocœlus uintensis.
GREEN RIVER SHALES.	

C.—Upper level. True Uinta. *Diplacodon elatus* beds. This is the level of the Princeton and probably the Marsh explorations. It is distinguished by the presence of three genera—*Diplacodon*, *Protoreodon*, *Leptotragulus*—which have thus far not been found below. It contains, however, several species which have also been found in the middle level. It is apparently distinguished by the *absence* of *Uintatherium*.

B.—Middle level. Transitional. *Telmatotherium cornutum* beds. This is a rich faunal level, hitherto unknown. *Telmatotherium cornutum* is very abundant. This is related to the White River or Lower Miocene by the presence of an ancient species of *Elotherium*, and probably of *Hyænodon*. It is related to the upper level, *C*, by similar species of *Mesonyx*, *Amynodon* and *Epihippus*, but is distinguished from *C* by the *presence* of *Uintatherium*. It is related to the eastern or Washakie Basin by the presence of *Telmatotherium hyognathum* and *Achænodon insolens*, and apparently to the Bridger by *Helaletes guyotii* and *Mesonyx obtusidens*, both of which determinations are however somewhat doubtful.

A.—Lower level. Base. *Telmatotherium megarhinum* beds. This level has been comparatively little explored. It contains *T. megarhinum*, also found in the Washakie, besides *Amynodon*, *Triplopus* and *Uintatherium*.

We have now to ascertain what type of *Uintatherium* existed as a contemporary of *Telmatotherium cornutum*. Judging from the limbs, it was a very large animal, and will not improbably be found to belong to the *Uintatherium cornutum* Cope, which was obtained at the summit of Haystack Mountain, or the very top of the Washakie beds.

II.—Preliminary Descriptive Report.

PRIMATES.

There are apparently numerous remains of Monkeys, Rodents and other small animals in a large block of sandstone, not yet worked out. We add a new type of *Microsyops*.

Microsyops uintensis, sp. nov.

Third premolar elevated and laterally compressed. Fourth premolar very small with three cusps in trigonid ; a very small and short talonid. First molar with paraconid. Second molar lacking paraconid.

The only Primate hitherto found in the Uinta Basin is *Hyopsodus gracilis* Marsh. The type of this new species (No. 1899) is a small jaw containing two premolars and two molars. It comes from the '*T. cornutum* level,' and is distinguished from the *M. gracilis* Leidy by the greater complication and relatively reduced size of the fourth premolar. The submolariform structure of $P_{\overline{4}}$, and the enlarged lateral pair of incisors, are the distinctive features of this genus. There is also an isolated lower molar, No. 1900.

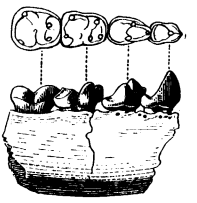

Fig. 1. *Microsyops uintensis*, type, No. 1899. Lower jaw, internal view ; superior view. One and a half natural size.

CREODONTA.

The Uinta Basin Creodonta thus far known are *Mesonyx* and *Miacis*. We add an apparently new form related to *Hyænodon*.

Miacis uintensis, sp. nov.

Fourth lower premolar with a high protocone bearing two cuspules upon the posterior slope, terminating in a talonid ; no cingulum. The third lower molar either very small and single-fanged or wanting.

The type lower jaw of this species (No. 1896) was found in *B*, close beneath the true Uinta level. It differs from *M. vulpinus* Scott in the structure of the fourth premolar, a tooth which in the latter species presents a complete cingulum and no cuspules. The trigonid of $M_{\overline{1}}$

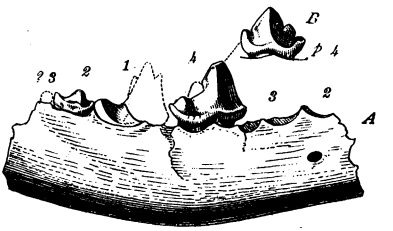

Fig. 2. *Miacis uintensis*. *A*, Type, No. 1896. External view of jaw, natural size. *B*, Fourth lower premolar, No. 1895.

is broken off, the talonid is broad and elevated upon the outer side. $M\frac{2}{2}$ is a small tubercular with a complete but very much depressed trigonid and a narrow talonid. $M\frac{3}{3}$ is represented by a very small single alveolus. Another jaw from the true Uinta level (No. 1895) contains a fourth premolar, which presents the same characters as the above.

? Hyænodon.

This genus is apparently represented by a jaw (No. 1893) from the middle or '*T. cornutum* level,' in which the teeth are too poorly preserved to afford means of definition. It is, therefore, not taken as a type. It presents many similarities to the *Hyænodon paucidens* jaw of the White River formation, especially in its

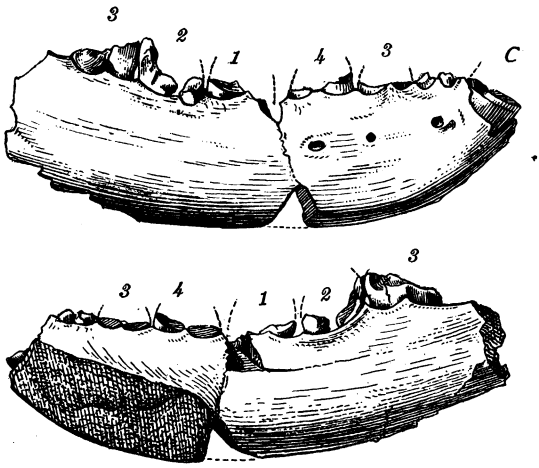

Fig. 3. *Hyænodon.* Lower jaw, No. 1893, internal and external views. Natural size.

very long stout symphysis and in its triple mental foramina. The specimen consists of a right mandible and a detached condyle. It contains the fang of a small lateral incisor and of a very stout canine. Behind this are two alveoli either belonging to two single-fanged teeth, $P\frac{1}{1}$ and $P\frac{2}{2}$—or to one tooth, bifanged $P\frac{2}{2}$. The formula is therefore uncertain; it is either P, 4 or P, 3. The

missing third and fourth premolars were stoutly bifanged and of similar size. The three molars were also apparently equal sized, narrow and bilobed as in *Hyænodon.*

Another specimen (No. 1894) may also pertain to this species. It consists of fragments of a molar tooth and of the limbs.

Mesonyx *Cope.*

There are two individuals belonging to this genus, both from the '*T. cornutum* level.' The first is a smaller animal (No. 1891) represented by the lower jaws and hind limb with a perfect foot, corresponding nearly in size with the *M. obtusidens* Cope, so fully described by Scott. The second is a very large skull apparently related to the following species:

Mesonyx uintensis *S. & O.*

This powerful mesoplacental is represented by a skull (No. 1892) belonging to a slightly smaller individual than the Princeton type, which was founded upon a series of lower molar teeth.

Measurements.

Total length of skull, estimated	.44	mm.
Incisors to condyles, "	.42	"
Length premolar-molar series	.137	"
Width across zygomatic arches	.27	"

The following are the principal characters: The cranium is slightly longer than the face. There is a high narrow occiput, extending forwards into a thin sagittal crest above a small brain-case. The frontals widen suddenly into a broad supraorbital plate which overhangs the rather small orbits. The nasals are long and narrow, but widen in the median line between the orbits. The maxillaries are compressed behind the canine, and perforated by an infraorbital foramen above M^1. The lachrymals are widely exposed upon the face. The zygomata are slender, but arch widely outwards and then suddenly descend into the glenoid fossa, which is very deep and presents sharp pre- and post-glenoid crests. Behind the glenoid region the skull is very short and the paroccipital plate is relatively narrow.

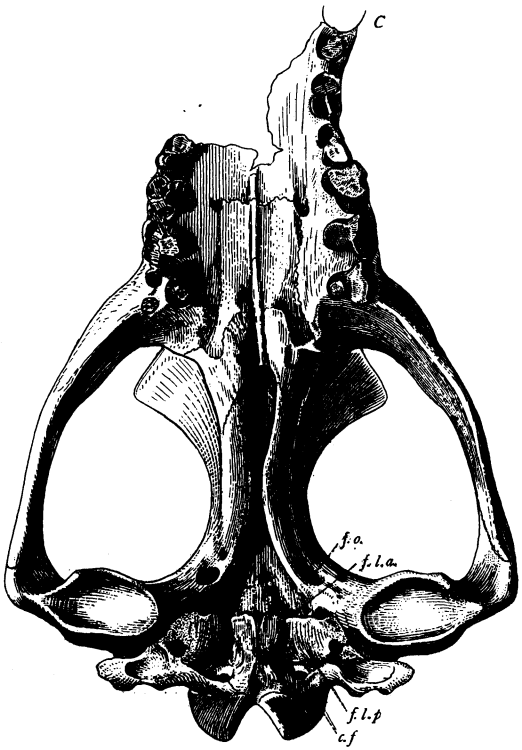

Fig. 4. *Mesonyx uintensis.* No. 1892. Base of skull. One-quarter natural size.

Foramina.—There is a strong mastoid foramen. The for. ovale pierces the ridge between the glenoid fossa and the pterygoid border. The periotic fills in the auditory meatus inferiorly, compressing the for. lac. medius and f. l. posterius into small spaces, behind which are the small condylar foramina.

The most distinctive feature of the skull is the backward extension of the posterior nares and the inclosure of the roof of the pharynx by two long palato-pterygoid plates, the lower borders of which incline towards each other in the median line so as almost to come in contact. This is paralleled by the well-known inclosure of the same region in certain species of *Hyænodon.*

We are also struck by the many points of parallelism which this skull presents with that of *Elotherium uintense*, a totally unrelated form. These parallelisms are undoubtedly attributable to adaptive conformation in both cases to a type of dentition and a mode of mastication which have many points in common.

RODENTIA.

This order is represented by a large number of remains of jaws and skulls contained in a block (Nos. 1907–1919) which has not yet been worked out. There are also the small undetermined jaw (No. 1908), the larger jaw (No. 1906) corresponding in size with *Plesiarctomys sciuroides*, and a number of upper and lower teeth which probably belong to *Paramys* Leidy.

Paramys uintensis, sp. nov.

Upper molars quinquetubercular with posterior cingulum and a mesostyle. Lower molars quadritubercular. Crown crenulate.

The type (No. 1901) is from the '*T. cornutum* level,' and deserves description. The upper molars are strictly tritubercular with slight anterior and prominent posterior basal cingula; the three primary cusps (paracone, metacone and protocone) are prominent, as are also the two intermediates (protoconule and metaconule). The lower teeth are much larger than in Leidy's types of *P. delicatus*, *P. delicatior* or *P. delicatissimus*. Marsh's *P. robustus*[1] is still indeterminate, not having been adequately described or figured, although proposed twenty-three years ago. These teeth present a similar, irregularly quadritubercular crenulated crown, whereas in *Plesiarctomys* we observe a smooth low-crowned type. *P. uintensis* is further distinguished by the apparent absence of a paraconid.

Fig. 5. *Paramys uintensis*. Type, No. 1901. Upper and lower molars, crown views. Twice natural size.

The upper molars furnish another link in the chain of evidence that the ancestors of the Rodents were tritubercular.

[1] Am. Journ. Sci., Sept., 1872.

AMBLYPODA *Cope.*

Uintatherium *Leidy.*

The discovery of remains of this genus in the Uinta Basin is an important one. In Horizon *A* was found the head of a humerus (No. 1881). In the more fully explored Horizon *B* remains of seven individuals were found, as follows: Occipital region of a skull (No. 1884), a humerus (1885), two femora (1880–87), frontal horns of two individuals (1889–89*a*), miscellaneous footbones of several individuals (1890).

We look forward with interest to the discovery of a skull from this level.

PERISSODACTYLA.

TITANOTHERIIDÆ.

PALÆOSYOPINÆ.

One of the chief results of this expedition is the clearing up of the cranial and dental characters and of the systematic position of *Telmatotherium*, a work which has been so ably begun in Earle's Memoir.[1] Numerous remains of the skeleton were also procured, but the description of these is reserved for a subsequent paper.

Historical Notes.—The following characters were assigned to *Telmatotherium validum* by Marsh[2] in 1872:

1. Premaxillaries compressed with an elongated median suture. Zygomatic arch slender. Upper molars with inner cones elevated and pointed, and with a well-developed basal ridge. Upper canines large, pointed, with strong cutting edges. Incisors with inner basal ridge. Palate deeply excavated between the premolars. Nasals decurved laterally and much compressed. Last upper molar with a single internal cone. Diameter upper premolar-molar series, 224 mm. Type species, *Telmatotherium validus* Marsh. Specimen found at Henry's Fork in the Main Bridger Basin. Date, July 22; separata, August 1, 1872.

[1] 'A Memoir upon the Genus Palæosyops Leidy and its Allies,' Journ. Acad. Nat. Sci. Phila., Vol. IX.

[2] Am. Journ. Sci. and Arts, Aug., 1872.

Four species have been subsequently described:

2. The second species *T.* (*Palæosyops*) *vallidens* Cope[1] was named by Cope September 19, 1872, from a series of upper premolars and molars found in the Bitter Creek region or Washakie Basin. It was, however, identified with *Palæosyops* and distinguished from *P. major* as follows: Molar teeth larger. Superior molars with two transverse ridges connecting the inner tubercle (protocone) with the outer crescents (paracone and metacone) enclosing a pit between them. Premolars with outer crescents fused into a single ridge. Summits of all the crescents elevated. All the teeth with strong internal basal cingula which rise up on the inner tubercle (protocone). Diameter upper premolar-molar series, 220 mm.

3. The third species described was the *T.* (*Leurocephalus*) *cultridens* of Scott and Osborn[2] in 1878. The type specimen is an upper jaw with a complete set of teeth and part of a lower jaw with the grinding teeth. Also the posterior portion of one of the nasals and a part of the frontals. Diameter upper premolar-molar series, 190 mm. The authors distinguished this type clearly from *Palæosyops* but not from *Telmatotherium*, with which Earle has shown it to be identical, although specifically distinct from *T. validum*. The locality is Henry's Fork, Bridger Basin.

4. The fourth species, *T.* (*Palæosyops*) *hyognathum*, was established by Scott and Osborn[3] in 1889, upon a very large jaw found in the Bitter Creek or Washakie Basin. It was characterized by its close series of procumbent incisors; a symphysis extremely long and shallow; the canines rather small and semiprocumbent; diameter of lower molar-premolar series, 245 mm; a large inferior diastema. Evidently related to *Diplacodon*.

5. The fifth species, *T.* (*Palæosyops*) *megarhinum*, was proposed by Earle[4] in 1891 upon a fine skull, also from the Washakie Basin (Princeton Mus., No. 10,008). The teeth in this type are badly damaged, so that new skull characters only could be assigned, namely: Molar with a shelf-like suborbital process; face very short; nasals very long, expanded distally; premaxillary symphysis short and narrow; palate narrow and arched. Diameter premolar-molar series, 148 mm. No superior diastema.

6. The new species *T. diploconum* and *T. cornutum* are here proposed.

The type of *T. validum* Marsh has not yet been figured, and its specific characters are still indefinitely known. The Museum collection now contains specimens which we refer to *T. vallidens*, *T. hyognathum* and *T. megarhinum*, besides the new species *T. diploconum* and *T. cornutum*.

[1] Proc. Am. Phil. Soc., Sept. 19, 1872, p. 487.
[2] Bull. E. M. Museum Geol. & Arch., 1878, p. 42.
[3] 'Mammalia of the Uinta Formation.' Trans. Am. Phil. Soc., 1889, p. 513.
[4] Am. Nat., Jan., 1891, p. 46.

Telmatotherium *Marsh.*

A genus partly contemporary with *Palæosyops*, but transitional in evolution to *Diplacodon*. An incipient fronto-nasal horn in the latest species. Nasals long and decurved laterally. Premolars simpler than molars. Upper molars with high pointed cusps, paracone and metacone approximated to protocone; conules reduced or wanting.

Comparative Measurements.

	Molar-premolar series.	Total length skull.	Width zygomatic arches.
Telmatotherium validum	.224		
" vallidens, type.....	.220		
" " No. 1569.	.184	.500	.33
" cultridens	.185		
" hyognathum, lower.	.239		
" megarhinum, type..	.145		
" " No. 1500.	.147	.355	.14
" diploconum	.174	?.450	?.216
" cornutum	.208	.565	.243

Telmatotherium megarhinum *Earle.*

Superior premolar series, 148. No diastema. A broad suborbital shelf. A long narrow sagittal crest.

When Earle established this species he left its generic position open, owing to the fractured condition of the teeth. The very complete skull (No. 1500) procured in 1893 from the lowest level, or *Hor. A*, contains perfect teeth, which are of the *Telmatotherium* type; this fact, together with the presence of an infraorbital shelf, as in the *T. cornutum* type, determine the generic position of this species. But this species with its long, thin and high sagittal crest presents a far more primitive condition than *T. cornutum*. It differs from *T. cultridens* also in the small oval section and short enamel area upon the canines, as well as in the infraorbital shelf and the posterior position of the infraorbital foramen.

Its general characters are as folllows: *Superior dentition:* The incisors are small, nearly continous, with a rounded anterior contour. The canines are small and rounded. The premolars 2–4 present large single internal cones. The molars exhibit basal cingula at the bases of the para- and metacones. There is a small hypocone upon M3.

The malars present a thin shelf. The zygomata diverge slightly posteriorly. The brain-case is small, and the sagittal and occipital crests are very prominent; the latter spread superiorly. The orbits are small and sunken, bounded by hook-shaped postorbital processes upon the frontals. The posterior nares open opposite the second molar. The postglenoid process is small. The premaxillary symphysis is apparently long. The infraorbital foramen is just at the anterior margin of the malar, and the space between the orbit and the nasal notch is very short. We also refer Nos. 1864–5 to this species and numerous skeletal remains.

Telmatotherium diploconum, sp. nov.

Superior premolar-molar series, 174 mm. A large hypocone upon last upper molar. Naso-frontals without horn. Long sagittal crest. Canines small, rounded.

The type is a skull (No. 1863) in which the nasals are wanting and the mid-region of the cranium was crushed. This type is remarkable in being of the same stage of evolution as *T. cultridens*, and yet occurring in the same level as the far more modernized *T. cornutum*.

This species differs from *T. megarhinum* in the absence of the infraorbital shelf, and in the presence of a large hypocone upon the last upper molar. The premolar-molar dentition is similar in size and form to that of *T. cultridens*, but there are the following important general differences: (1) Canines small and circular in section; (2) a very short diastema, if any, behind the canine; (3) a large hypocone upon M^3; (4) the infraorbital foramen close beneath the anterior border of the molar.

In several respects it distantly resembles *T. megarhinum*. The occiput is small and high. There is a long sharp sagittal crest extending about halfway forward to the orbits. The posterior nares is opposite the second molar.

The premaxillary symphysis is relatively short. The zygomata are nearly parallel with the side of the skull, but they arch upwards posteriorly; there is a very prominent postorbital process. The form of the molar, at its junction with the premaxillaries, is very similar to that in *T. cultridens*, but the infra-

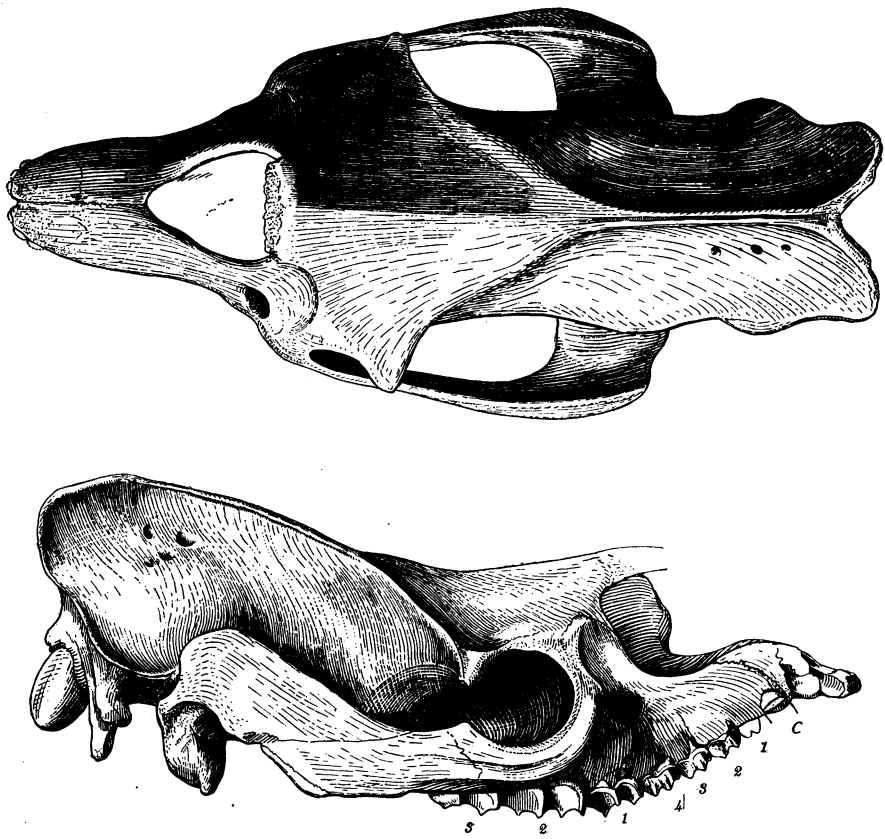

Fig. 6. *Telmatotherium diploconum.* Type, No. 1863. Superior and lateral views of skull. One-fourth natural size. The nasals are broken off.

orbital foramen is immediately in front of the suture, instead of being placed well forwards. The incisors are wanting. The canines are very small and circular in section at the base. The second premolars are in a slightly more advanced stage of evolution than in *T. cultridens.* The outer lobes of the molars are very much elevated, with feeble basal cingula. The hypocone of $M^{\underline{3}}$ is quite as large as those of $M^{\underline{1}}$ or $M^{\underline{2}}$.

Telmatotherium hyognathum *S. & O.*

Incisors, $\frac{3}{3}$. Inferior premolar-molar series, 224 mm.; lower molar cusps high and pointed. Three lower incisors. Lower canines rounded, followed by a wide diastema.

This species is represented by a very large pair of lower jaws (No. 1856) containing *three* incisors and agreeing in all other respects with the type of *T. hyognathum.* It is noteworthy that the canines have short enamel crowns and are formed like those of the Miocene Titanotheres, but the jaw itself differs widely from the Titanothere type in the long shallow symphysis.

Telmatotherium vallidens *Cope.*

Superior premolar-molars series, 184–220 mm. A narrow diastema. Molar cusps less elevated. A rudimentary naso-frontal tuberosity. Premaxillary symphysis short. Top of cranium flattened; very short bifid sagittal crest.

The examples of this species are not from the Uinta but from the *Washakie* Basin, and were found by the Bridger expedition of 1893 in a brown layer of sandstone three miles north of the base of Haystack Mountain upon Bitter Creek. They are described here as an important link in the Telmatotherium series. The molar teeth as displayed in the two skulls (Nos. 1569, 1570) agree closely in every detail with those of Cope's type[1] also found in this basin, although they are considerably smaller, measuring only 184 mm. as against 220 mm.[2] They are distinguished from the molars of *T. vallidum* (Marsh) by the lower and more obtuse cusps. The skull is distinguished by the short premaxillary symphysis. The species is distinguished from *T. hyognathum* by the very narrow post-canine diastema; from *T. cultridens* by more obtuse molars and by the naso-frontal tuberosity; from *T. cornutum* by the short posterior constriction of the temporal ridges into a bifid sagittal crest.

When these skulls were discovered they were described by Dr. Wortman, in a letter from the field, as *Manteoceras* or 'prophet-horned.' But in the Museum great doubts were expressed by

[1] See Tertiary Vertebrata, Plate 51, Fig. 1.
[2] It appears as if Cope's measurements were erroneous.

Professor Cope and by others who examined them as to whether the tuberosities (*H*) above the orbits could really be regarded as incipient horns. These doubts have now been removed by the discovery of *T. cornutum*, and Dr. Wortman's observation is verified.

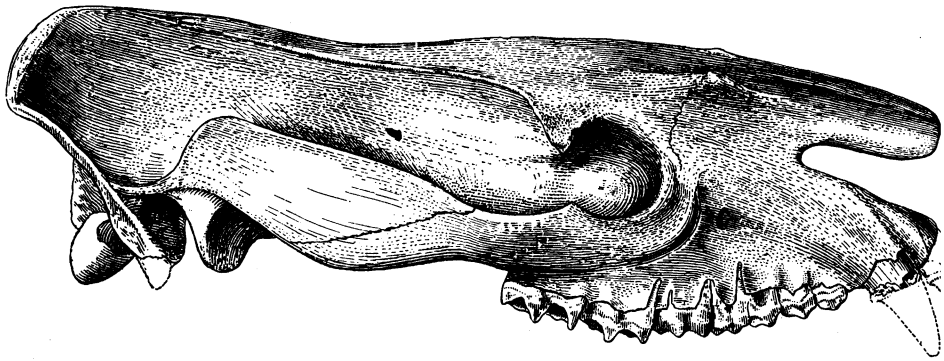

Fig. 7. *Telmatotherium vallidens.* Composition, Nos. 1569–70. Side view of skull. One-fourth natural size.

T. vallidens presents the first transitional features towards *T. cornutum* and the later Titanotheres. The horns exhibit the most rudimentary stage imaginable ; they are borne more upon the frontals and less upon the nasals than in *T. cornutum.* The cranium is broad upon the upper surface between the orbits and narrows very gradually towards the occipital region, where the two temporal crests converge. They do not, however, unite into a single sagittal crest, but leave a deep median pit followed by a narrow valley which opens out into a triangular space between the occipital crests. The occiput is very broad and low.

In addition to those above mentioned, there are other features which separate *T. vallidens* from *T. cornutum*, especially (1) the absence of an infraorbital shelf upon the malar, (2) the short wide-spreading and relatively heavy form of zygomatic arches, (3) the relative shortness of the nasals, (4) the more slender postglenoid processes, (5) the shortness of the premaxillary symphysis. In general the face and the nasals are relatively shorter in *T. vallidens* than in *T. cornutum ;* there is little or no diastema behind the canines ; the posterior nares open much further forwards, or

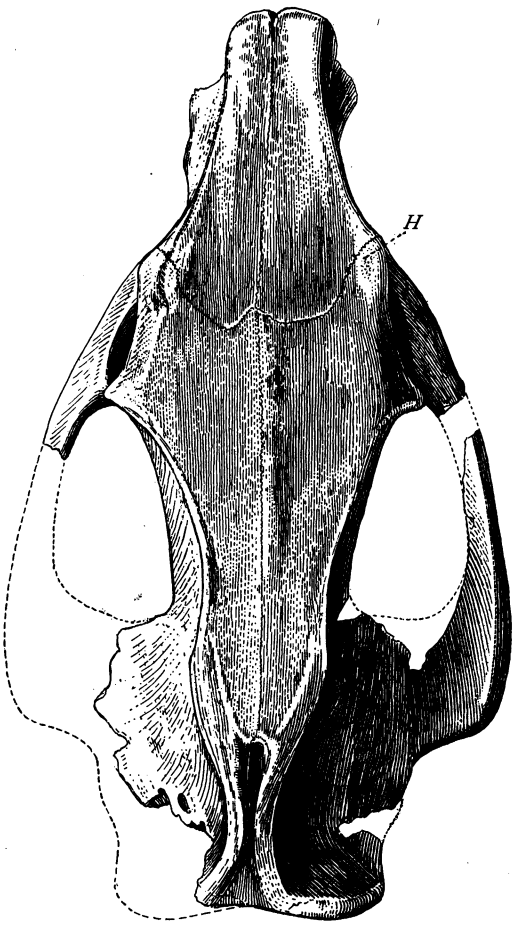

Fig. 8. *Telmatotherium vallidens.* No. 1569. Superior view of skull. One-fourth natural size.

between the second molars; there is no trace of a hypocone upon $M\frac{3}{}$.

The canine crowns are wanting; they are rounder in section and much more powerful than in *T. cornutum.* The opposite molar series are not so nearly parallel. The true molars exhibit the Telmatotherium type, but it is less sharply defined than in *T. cultridens* or in *T. cornutum.*

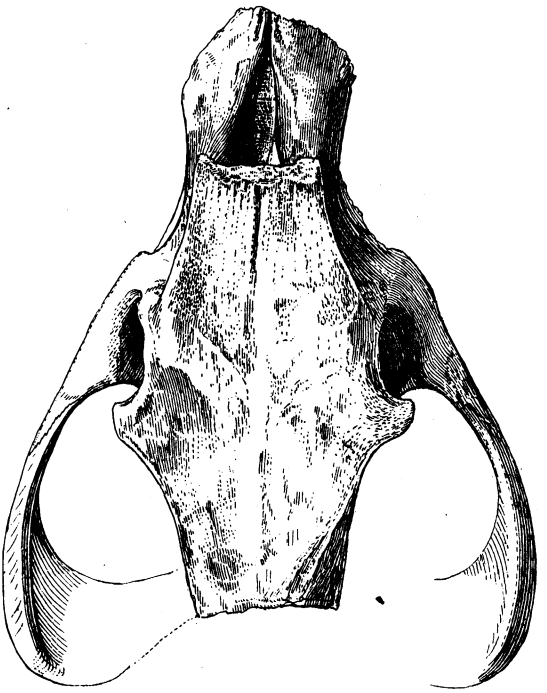

Fig. 9. *Telmatotherium vallidens*. No. 1570. Superior view of skull. The upper surface of the frontals and nasals is abraded.

There are only a few resemblances to *T. cornutum*, such as the proportion of the teeth and the development of basal cingula, the reduction of the intermediate tubercles upon the molars. The general conformation of the zygomatic arches presents an affinity to that of the *Titanotherium bucco* type of the Miocene.

Telmatotherium cornutum, sp. nov.

Incisors $\frac{3}{2}$. Premolar-molar series, 208 mm. A narrow diastema. Upper canines lanceolate. Long premaxillary symphysis. A well-developed naso-frontal protuberance. Top of cranium completely flattened. No sagittal crest. An infraorbital process upon malar.

The type of this species is a fine skull (No. 1851), while several other well-preserved skulls from the same levels give us all the

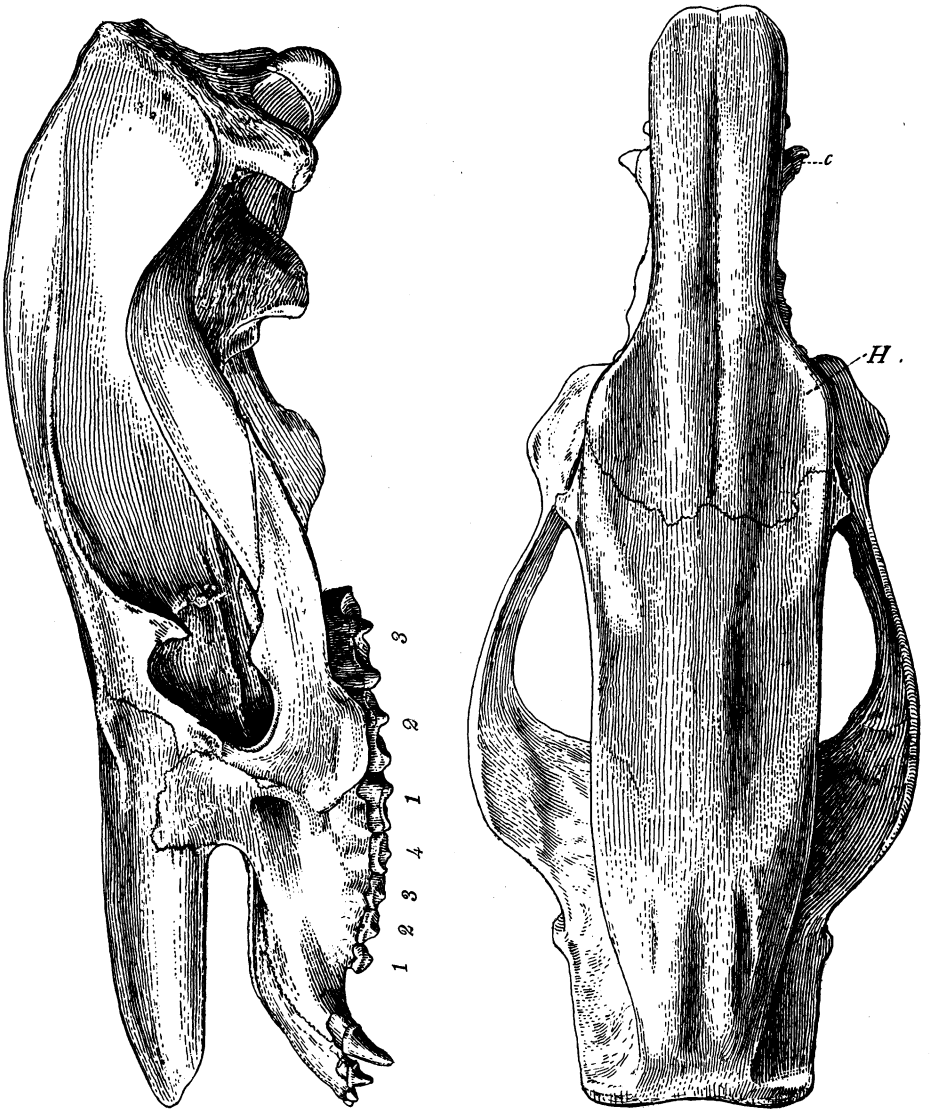

Fig. 10. *Telmatotherium cornutum.* Type, No. 1851. Superior and side views of skull. One-fourth natural size. Fronto-nasal horn at *H*.

cranial characters and the superior dentition (Nos. 1850, 1847, 1848, 1852, 1837). Unfortunately none of these skulls have the jaws associated with them, but several more or less perfect jaws, although found apart, agree perfectly in size (Nos. 1857, 1858, 1854, 1855); they are all readily distinguished from the jaw of *T. hyognathum* by the presence of *only two incisors.*

This species is remarkable for its very long flat-topped cranium and its incipient knob-like osseous horns borne chiefly upon the nasals but partly upon the frontals. These horns project laterally and rise slightly above the general surface, and are best seen in the anterior view, Fig. 10. These characters and the absence of the fronto-parietal and interparietal sutures all point well towards *Titanotherium*, but the premolars are still absolutely simple, showing no trace of the postero-internal cusps which characterize *Diplacodon elatus.*

Other striking peculiarities are the upward arching mid-cranial region, the extremely long, narrow and laterally decurved nasals; the strong infraorbital shelf upon the molars (seen also in *T. megarhinum*), the slender zygomatic arch, the low occiput, the backward extension of the posterior nares by the palatines, and the partial inclosing of the roof of the pharynx by the pterygoids.

More in detail (No. 1851) the *nasals* almost overhang the premaxillaries, they are laterally compressed above the infraorbital foramina so as to give the impression of distal expansion; the median fronto-nasal suture extends back beyond the mid-orbital line, but laterally the nasals terminate just above the orbits so as to include most of the incipient horn. The *premaxillary* symphysis is elongate as in *T. validum.* The *maxillaries* are shut off by the very narrow lachrymals from the anterior border of the orbits. The infraorbital foramen is placed above $M\frac{1}{2}$ in front of the molar suture. The *molars* extend sharply upon the side of the face and then dip into the outwardly projecting shelf; with an obtuse postorbital knob. The *frontals* exhibit a prominent postorbital hook; there is a delicate lateral ridge marking the limits of the temporal fossa; between these ridges the cranium is arched both from side to side and antero-posteriorly, presenting a very different form from the concave profile of even the oldest known Titanothere; there is a slight constriction in the posterior third,

but the cranium is even here two inches wide, and there is not the semblance of the crest seen in *T. vallidens;* the entire absence of the upper cranial sutures even in the young individuals (No. 1847) is a noteworthy Titanothere character. Owing to the sudden dipping of the superior contour the occiput is rather low and subquadrate in outline.

In side view the faint temporal ridges can be traced to the superior angle of the occiput. The zygomatic arch is very slender; it arches slightly upwards and very much less strongly outwards than in *T. vallidens.* The postglenoid process is very thick in antero-posterior section.

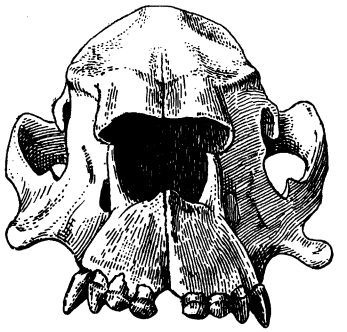

Fig. 11. *Telmatotherium cornutum.* Type. Anterior view of the skull.

In palatal view we observe a diastema between the median incisors and a post-canine diastema of 28 mm. The molar series are placed closely parallel so that the palate is long, narrow and deeply arched, and the posterior nares opens far back behind the last molar. The deep and long pterygoids arch towards each other in the median line, forming a deep fossa.

Foramina.—The alisphenoid canal is very long; the for. ovale is widely separated from the for. lac. medium; the for. lac. medium and the for. lac. posterius are very small and partly confluent; the condylar foramen is midway between the condyles and the for. lac. medium.

Lower Jaw.—The most perfect of the lower jaws is No. 1857; it agrees in size exactly with the type skull No. 1851. In proportion it is rather shallow and slender, but presents somewhat more angulation of the chin than in *T. hyognathus.* The most distinctive character is the extremely long hook-shaped coronoid process which extends back over the condyle. The symphysis is long and rather shallow.

Dentition.—Inferior: A very distinctive and progressive feature is the presence of but two incisors in the lower jaw. The formula

is thus $I\frac{3}{2}$, $C\frac{1}{1}$, $P\frac{4}{4}$, $M\frac{3}{3}$. A second Titanothere feature is seen in the relatively short, rounded canines of the lower jaw, which present a wide contrast with the compressed lance-shaped tusks of *T. validum* and *T. cultridens;* an especial feature is the absence of enamel upon the fang. It is to be noted, however, that the specific reference of these jaws is not certain.

Superior: The incisor series of the type (No. 1851) present a third circle, but the median incisors are separated by a slight space; they all exhibit prominent posterior basal cingula; the lateral incisor is considerably enlarged. The *canines* have short, outwardly and forwardly directed but slightly incurved crowns, with rather sharp borders, a suboval section and posterior basal cingula. Behind a short diastema is the first *premolar*, a simple, conical crown with an internal basal ridge; the second, third and fourth premolars exhibit *single* blunt or rounded internal cones, incomplete cingula, a strong antero-external (parastyle) and a feebler postero-internal (metastyle) ridge. The *molars* have the generic conformation; the third molar is the largest of the series, and exhibits a strong parastyle and mesostyle and a feebler metastyle; there is a strong cingulum at the outer base of the paracone, and a feebler one at the outer base of the metacone; the hypocone is feebly developed upon $M\frac{3}{3}$. All these teeth are well-worn, and the animal was fully adult.

The superior dentition of No. 1850 belongs to a younger animal with sharply defined characters. Here we see more plainly the resemblances to the type of *T. cultridens.* The canines are laniariform, with sharp lateral edges, basal cingula less marked and enamel continued far down. The outer faces of the premolars and molars are prominent and closely approximated to the internal cusps. We observe also a trace of the paraconule upon $M\frac{2}{2}$, and a distinct paraconule upon $M\frac{3}{3}$. In this specimen the pterygoids are long and not so deep.

Telmatotherium validum *Marsh.*

Superior premolar-molar series, 224 mm. Molar cusps high and pointed with rudimentary intermediate tubercles; last upper molar without hypocone. Second premolar with strong internal lobe. Premaxillary symphysis long? No infraorbital shelf.

For the sake of completeness this definition is framed from Marsh's brief description.

Telmatotherium cultridens *S. & O.*

Superior premolar-molar series, 190 mm. Molars with nearly obsolete conules. Second premolar with feeble internal lobe. Last upper molar without hypocone. Canines laterally compressed. Naso-frontals without tuberosity. Premaxillary symphysis long. No infraorbital shelf.

There are several possibilities of error in the separation of these species, and these cannot be removed until *T. hyognathum* and *T. validum* are known both in the upper and lower dentition.

AMYNODONTIDÆ.

The independent position of this family has now been completely established by the discovery in the Miocene of the complete skeleton[1] of *Metamynodon* showing four fully functional digits in the fore-foot. Additional characters of the family are brought to light by a second complete skeleton (No. 1933) found by Mr. Peterson in the true Uinta or upper level, Horizon *C.*

The specific position of this animal is difficult to determine owing to the immature state of the dentition. It is provisionally referred to *A. intermedius* S. & O.

Amynodon intermedius *S. & O.*

Dentition: $I\frac{3}{3}$, $C\frac{1}{1}$, $DP\frac{4}{4}$, $M\frac{3}{3}$. Upper canines suboval in section, inclined forwards. Four deciduous premolars in both jaws. Four permanent premolars in the upper jaw.? Lower canines erect, triangular.

The skeleton is that of a half-grown animal. The epiphyses are detached from many of the limb bones and from all the vertebræ. As in all fossils from the clay matrix of this level the bones are considerably crushed. The adult was a rather slenderly built, long-limbed animal, exceeding the largest Tapir in size. The manus was considerably longer than the pes, but we observe

[1] Foss. Mamm. of the Lower Miocene, White River Beds, Bull. Am. Mus. Nat. Hist., July, 1894, p. 208.

a very slight disparity in length between the tibia and the femur, the radius and the humerus. The skull is broad and flat, of entirely different proportions from the skull of *A. antiquus*, which is high and narrow. It has the deep depressions in front of the orbits of *A. intermedius*, but a much longer face and longer nasals than in *Metamynodon.*

Measurements.

Total length of skull, premaxillaries to occiput	.53	mm.
Length of humerus from facet to facet	.302	"
" radius " " "	.305	"
" femur " " "	.36	"
" tibia " " "	.28	"
" metacarpal III	.163	"
" metatarsal III	.124	"
Os-innominatum, total length	.47	"

Dentition.—There are three complete upper and lower incisors; the latter are well preserved, and exhibit a posterior basal ridge and median column. The permanent lower canines are erect and triangular, while the upper are directed slightly forwards and are rounded upon the outer and flattened upon the inner surfaces. These teeth are only partially extruded, and it is, therefore, difficult to compare their form with those of the type of *A. intermedius*. The four deciduous premolars are still in place. The molar teeth agree closely with the *A. intermedius* types in form and measurement.

Skull.—The cranium is considerably crushed. The premaxillaries are short, slender superiorly and barely in contact with the nasals. The maxillaries are deeply concave in front of the malar antorbital bar. The zygomatic arch is comparatively slender, wide below the orbit and not very deep; there are two knob-like projections, also characteristic of *Metamynodon*. The external auditory meatus is open below, and the paroccipital process is very slender, and curves forwards inferiorly. The occiput is rather broad and low, overhanging the condyles.

The base of the skull displays a rather broad, slightly concave palate, the posterior nares opening behind the second molar. The zygomatic arch spreads into a broad, flat triangular space around the glenoid fossa, the postglenoid crest being slightly everted.

The basi-cranial axis (basi-occipital and sphenoid, presphenoid) is a prominent ridge upon either side of which is a deep depression containing the for. lac. medium and posterius. The for. ovale is widely separated from the for. lac. medium, while the condylar foramen is very close to the for. lac. posterius. The alisphenoid canal is apparently very short; the mastoid foramen is very distinct.

In the top view of the skull the nasals are relatively long; they are separated posteriorly by a median forward projection of the frontals. The brain-case is very large; the sagittal crest is low and sessile.

The jaws resemble those of *A. antiquus* in the very high condyles and the narrow recurved coronoids.

Vertebræ.—The characters of the vertebræ have not yet been completely studied. The centra are rather small. The anterior dorsals present moderately long, slender spines.

Fore Limb.—The humerus is of the same total length as the femur, owing to its very broad and prominent great tuberosity, which is connected by a low ridge with the lesser tuberosity. The deltoid ridge is strong and rugose. The internal and external condyles are subequal in size. The ulna and radius are strikingly long and slender; the ulnar shaft has a deep trihedral section; the radius presents a shallow humeral facet. The metapodials of the manus are longer than those of the pes; they are of high slender proportions; the third metacarpal is slightly the longest, but the foot is functionally tetradactyl. The magnum is of the typical Rhinoceros form.

Hind Limb.—The innominate bones are elongate and slender. The superior border of the ilium is not evenly rounded, but is excavated towards the sacral border, and elevated and evenly arched towards the external border. The ischial border is straight, and the pubic border deeply incurved. The pubis is short and the ischium long. The obturator foramen is completed by an internal bridge, which is greatly reduced or wanting in *Metamynodon.* The acetabulum has a deep pit for the ligamentum teres.

The femur is distinguished by the antero-posterior diameter of the great trochanter, the small head with a large ligamentum teres pit, the antero-verted lesser trochanter, the prominent third trochanter slightly above the middle line, the moderately heavy shaft. The crus is somewhat shorter than the femur, but there is less disparity by far than in *Metamynodon.* The fibula is long and very slender. The astragalus is broad with a short neck. The calcaneum is distinguished by the flattened transversely placed tuber, as in *Metamynodon.* The cuboid is broad and flat, with a narrow calcaneal contact. There is no metapodial displacement; these elements are rather short and stout.

EQUIDÆ, TAPIRIDÆ, HELALETIDÆ.

The smaller Perissodactyla are represented by remains of *Epihippus*, *Isectolophus*, and *Helaletes.* The former (No. 1931), from the true Uinta, is represented by two femora and part of an astragalus, corresponding in size with the *Epihippus uintensis* S. & O. These parts of the skeleton are actually smaller than in Cope's type of *Hyracotherium venticolum* from the Wind River Beds, or base of the middle Eocene.

Several imperfect jaws and teeth (No. 1927) correspond in size with *Isectolophus annectens* S. & O. *Triplopus* is represented by a lower jaw (No. 1928) containing the fourth premolar and first molar.

From the '*Telmatotherium cornutum* level' comes also a fine maxilla (No. 1929) of *Helaletes guyotii* containing $P\frac{4}{4}$–$M\frac{3}{3}$. In this specimen the fourth premolar has two complete transverse crests, the metaloph being as elevated as the protoloph; it is, therefore, in a slightly more advanced stage of evolution than the Princeton type. The animal was also about one-fourth larger. It has not been hitherto reported from the Uinta Basin.

INCERTÆ SEDIS.

Sphenocœlus uintensis.

This new genus is represented by the posterior portion of a skull, which is distinct from any cranium known to the writer. Its most distinctive feature is the presence of a pair of pits in the

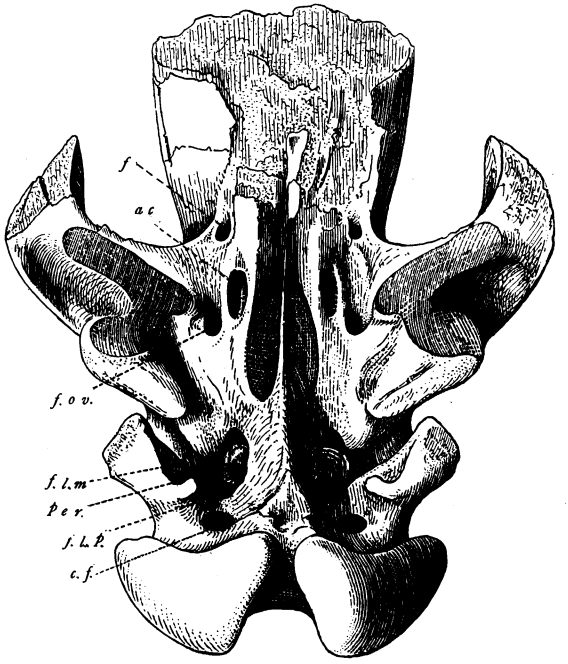

Fig. 12. *Sphenocœlus uintensis.* Type. Base of skull. One-fourth natural size.

floor of the skull upon either side of the narrow presphenoid. These pits were at first mistaken for the for. lac. media, but more careful investigation shows that they are roofed over by bone, and apparently do not communicate at all with the cranial cavity. The pit on the right side is perfectly preserved and clearly exhibits these characters. The measurements of the pits are 42 mm. long, 14 mm. wide, and 2 mm. deep.

The skull has a long narrow cranium surmounted posteriorly by a sagittal crest, which diverges anteriorly into two decidedly convex sagittal ridges. The occiput is rather broad, and below it are two widely set occipital condyles which are directed obliquely downwards and backwards. On either side of these the ex-occipitals extend down into obtuse paroccipital processes, which are closely joined to the post-tympanics. The external auditory meatus is open inferiorly. In front of this the postglenoid

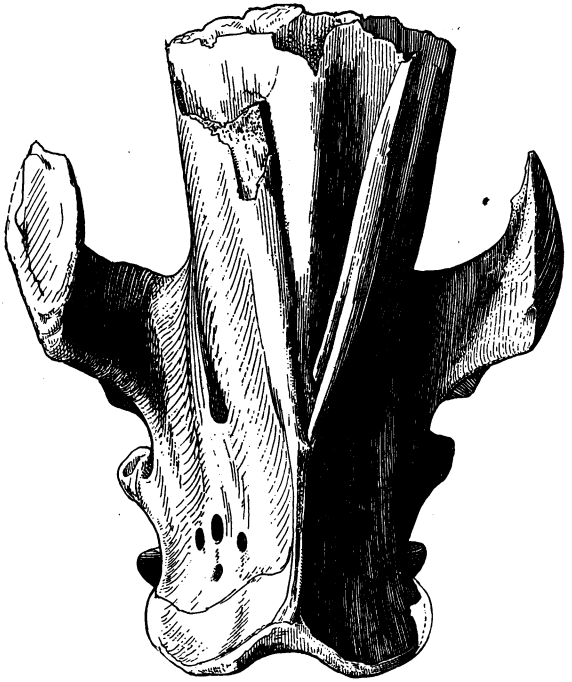

Fig. 13. *Sphenocœlus uintensis.* Superior view of cranium.

process faces somewhat inwards ; the glenoid facet is L-shaped, two narrow arms extending out upon the squamosal, and a broad arm descending upon the postglenoid. The distinctive feature of the zygoma is the presence of a deep depression just behind the lateral arm of the glenoid facet.

Skull Measurements.

Width across zygomatic arches	.23	mm.
Height of occiput	.142	"
Breadth "	.117	"
Breadth of occipital condyles	.13	"
Basi-occipital to top of sagittal crest	.144	"

The foramina of the skull are related to those of the Perissodactyla, for there is a long alisphenoid canal, upon the outer side

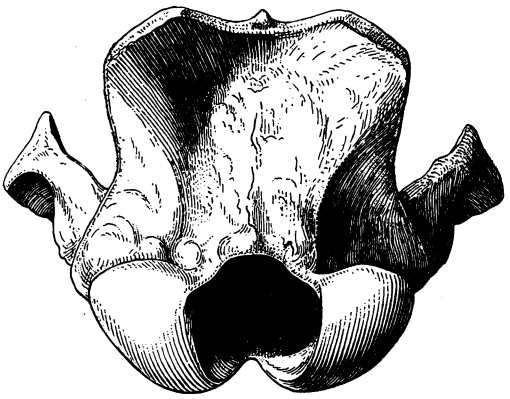

Fig. 14. *Sphenocœlus uintensis.* Occiput.

of the anterior opening of which is the foramen. Just behind the posterior opening of the canal is the foramen ovale, and between these foramina are the two pits above mentioned. This foramen is separated by a very wide plate of bone from the for. lac. medius, which is partly filled by the periotic mass.

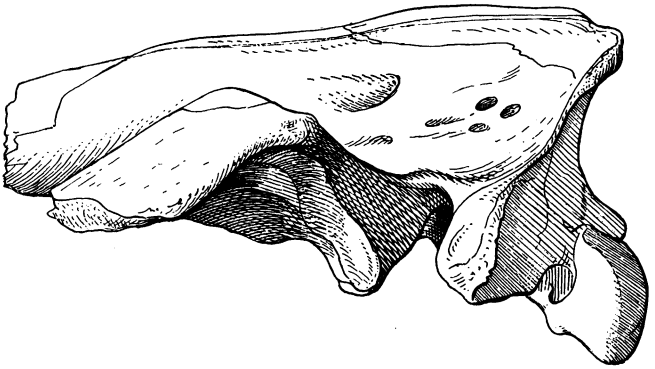

Fig. 15. *Sphenocœlus uintensis.* Side view of cranium.

The distinctive features of the skull may therefore be summed up as follows: Deep paired pits in the alisphenoids, and orbitosphenoids upon either side of the thin presphenoid; a long alisphenoid canal; foramen ovale widely separated from for. lac.

medium; condyles very broad; foramen magnum large; occipital crest extending anteriorly into a short sagittal crest with convex sagittal ridges; skull apparently long and narrow.

The relationships of this form are very difficult to determine. It has been compared with *Halitherium*, but without revealing any very close resemblances. The alisphenoid canal suggests that it is a Perissodactyle, and the form of the posterior portion of the skull is certainly very similar to that of *Chalicotherium*, but it lacks the robust tympanics observed in the European form, and exhibits the anomalous paired depressions in the roof the pharynx which so far as known to the writer are unique. An especial effort will be made to secure the teeth of this animal in order to elucidate this problem.

ARTIODACTYLA.

Elotherium uintense, sp. nov.

Orbits open posteriorly. No inferior projections upon the malars. A preglenoid crest. Premolars 4 or 3.

This species is named *uintense* to emphasize the surprising fact of its discovery in the Uinta Basin or *true Eocene*. It is even older than the period of the true Uinta beds, since it comes from the *Telmatherium cornutum* level and *below* the typical Uinta or *Diplacodon elatus* level.

Measurements of Skull.

	E. uintense.	E. mortoni.
Length condyles to premaxillaries	.43 mm.	
Width zygomatic arches	.384 "	
Height of occiput	.114 "	
Front of orbit to condyles	.225 "	.185 mm.
Molar-premolar series	.142 "	
Molars	.07 "	.068 "
Antero-posterior diameter of canines	.44 "	

Comparison with Leidy's original specimens of *E.* (*Archæotherium*) *mortoni* from the White River (Am. Mus., Nos. 443–4) shows that the *E. uintense* skull was one-fourth larger and much more robust. In *E. mortoni* the sagittal crest is thinner, the supra-orbital plates are narrower, the swelling for the brain upon

the outer surface of the cranium is more sharply defined, the face is relatively straighter. In fact, the Miocene type is smaller and less specialized than the Eocene, and the relations are the reverse of what we should have anticipated.

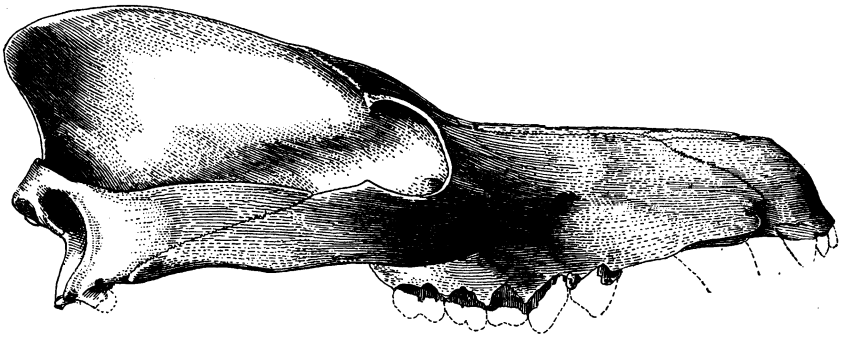

Fig. 16. *Elotherium uintense.* Type. Lateral view of cranium. One-fourth natural size.

It is readily distinguished from *Achænodon robustus* of the Washakie beds by the great elongation of the face and the shortening of the cranium, both of which characters relate it to *Elotherium*. It agrees with *Achænodon* and differs from the oldest types of *Elotherium*, however, in the orbits, which are widely open posteriorly. Unfortunately the premolar formula is uncertain, all the teeth are broken off and it is not possible to determine whether both $P\frac{1}{1}$ and $P\frac{2}{2}$ were present; there was either one single-rooted followed by one two-rooted tooth, or there were two one-rooted teeth here. It seems most probable that there were only three premolars.

The three incisors increased in size laterally, the $I\frac{3}{3}$ being much the largest. The canine tusks were very powerful. The molars, so far as preserved, resemble those of *Achænodon robustus*.

The premaxillaries exhibit a wide contact with the nasals. The nasals are very long, narrow and indented anteriorly; they extend posteriorly to a point opposite the middle of the orbits. The lachrymals are extensively exposed upon the face. The infra-orbital foramina are nearer the orbits than in *Achænodon*. The frontals form a very broad, centrally depressed, plate over the

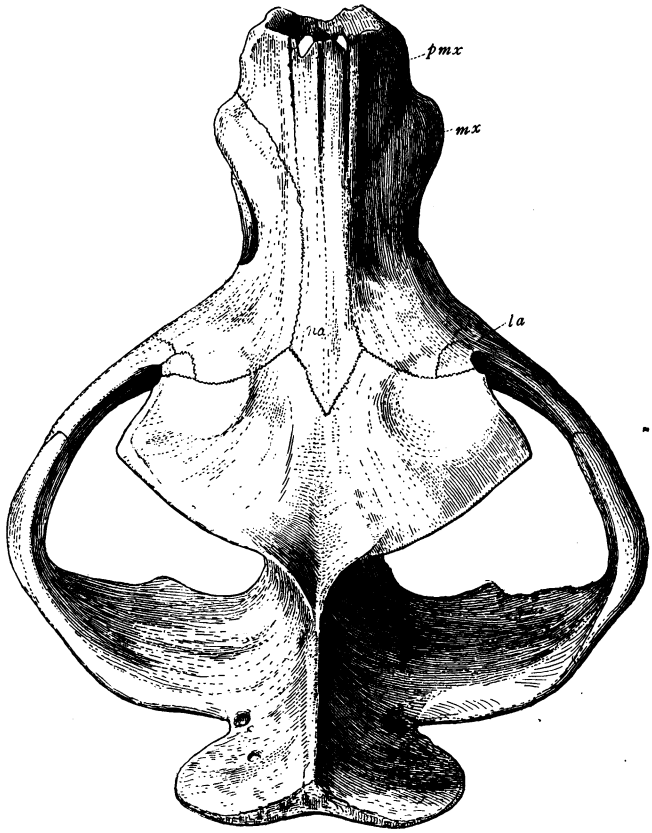

Fig. 17. *Elotherium uintense.* Superior view of cranium.

orbits, overhanging but leaving them widely open; the orbits are much larger than in *A. robustus.* The frontals converge suddenly into the rather short, very sharp and high sagittal crest. The brain-case is very small. The occiput is high and expands fan-like superiorly as in *Elotherium.* The zygomatic arches are slender in vertical diameter and lack the downward malar plates; as shown in top view they diverge or arch sharply outwards. As in *Achænodon* the glenoid fossa is deeply depressed and there is a prominent preglenoid crest. The palatal surface displays the posterior nares opening behind the last molar; the remains of a

deep pterygoid fossa; a very broad glenoid fossa; a short wedge-shaped basi-cranial series (basi-occipital and sphenoid, pre-sphenoid).

The collection embraces a complete artiodactyl hind limb (No. 1820), including a femur, tibia, astragalus and calcaneum, cuboid and a metatarsal. The total length is 90 cm. or 35½ inches. In comparison with that of *Elotherium* the femur is very short, and there were apparently *four* metatarsals, as indicated by facets upon the median pair. If this limb is related to the above skull it would distinguish it as a new generic type which might be named *Protelotherium*, characterized by four digits in the pes.

Achænodon insolens *Cope.*

It is interesting to find this species, which is characteristic of the Washakie, upon the same level as the *Elotherium*. It is represented by a lower jaw (No. 1825) which corresponds closely with Cope's type.[1] The crown of the teeth are crushed and broken. There is also a portion of a lower jaw (No. 1819) containing the fourth deciduous premolar and an unworn first molar.

The smaller selenodont Artiodactyla are represented by lower jaws and teeth provisionally referred to *Leptotragulus* and *Protoreodon* (Nos. 1800–1818, 1826–1826*a*), but they add nothing to our knowledge of these selenodonts.

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[1] Tertiary Vertebrata, p. 433, pl. 57.