APPENDIX.

ART. XXXI.—*Discovery of Cretaceous Mammalia. Part III;* by O. C. MARSH. (With Plates V–XI.)

IN this Journal for July, 1889, the writer announced the discovery of various remains of Cretaceous mammals in the Laramie of Wyoming, and gave figures and brief descriptions of some of the best preserved specimens. In the following number, the subject was continued, and additional remains were described.* Since then, systematic explorations have been made in the same and other localities, and, at the present time, more than a thousand specimens are available for examination. These fossils are all fragmentary, but they throw considerable light on this peculiar fauna, showing it to be as yet limited, but more varied than the first discoveries indicated.

All the mammals found are small in size. They are mainly Mesozoic in type, and more nearly related to the Jurassic forms below than to those in the Tertiary above. Carnivores, Rodents, and Ungulates, still appear to be wanting in this horizon, and true Insectivores have not yet been identified with certainty. The *Allotheria* are most numerous, and the evidence that this group is closely related to the modern Monotremes, if not their ancestors, has been strengthened by the discoveries recently made. The *Cimolestidæ*, a family allied to the existing Opossums, are especially abundant, and other Marsupials appear to be represented among the remains secured.

In this paper, the third of the series, additional specimens from the same horizon are briefly described, and these and many others are carefully figured. In a later communication, the relations of these forms to each other and to allied Mesozoic and Tertiary mammals will be considered, and the whole subject fully discussed.

* This Journal, III, vol. xxxviii, pp. 81–92, plates ii–v, July, 1889: and pp 177–180, plates vii–viii, August, 1889.

In the present article, as in the two preceding it, the remains selected as types are all characteristic specimens, which, although fragmentary, will admit of accurate determination whenever more complete material is available for comparison. This is a point of much importance, as paleontology has suffered grievously from descriptions of fossils without characters sufficiently definite to distinguish them from more perfect remains subsequently brought to light. It is a matter of much less importance if such discoveries should prove that two or more specimens described as distinct really pertained to one animal. The advance of the science throughout the world has not been retarded by such preliminary reference, but has often been greatly promoted by making known promptly single facts of importance, leaving their full significance to be determined by later discoveries, made under more favorable circumstances.

The fact, that, for half a century or more, search for mammals in the Cretaceous had been made in vain, indicates the importance justly attached to their recent discovery, and is a sufficient excuse, if any were wanting, for making known the little now accomplished by continued and laborious explorations. The diminutive size of the Cretaceous mammals found, and the nature of the deposits in which they were entombed, readily account for the incomplete and isolated fragments thus far secured. The determination of such remains must of necessity be more or less provisional. It will be seen, however, from the specimens figured and described in the present article, that among the great number obtained, there are some which give valuable information in regard to mammalian life in Cretaceous time.

The geological lesson now taught by these mammalian relics and their associated vertebrate fossils is no less important, but hardly what was expected. These remains are not transitional between Mesozoic and Tertiary forms, but their affinities are with the former beyond a doubt; thus indicating a great faunal break between the time in the Cretaceous when they lived and the earliest known Tertiary, or between the Ceratops horizon and the Coryphodon beds of the Eocene Wahsatch. The lower division of the Coryphodon beds, or lower Wahsatch (Puerco), is clearly Tertiary, and the great break is between this horizon and the Ceratops beds of the Laramie. Each of these faunas is now known by many species of vertebrate fossils represented by hundreds of specimens, and the more the two are compared the stronger becomes the contrast between them. Instead of placing them close together, as some geologists seem inclined to do, it will be more profitable

in future to search for the great series of intervening strata containing the forms that lead from one to the other.

Whether the missing deposits are Cretaceous, transitional, or Tertiary, or all three, they must exist somewhere, for their existence is demonstrated by what is known of vertebrate life below and above them. This knowledge has been mainly secured within the last few years, and has hardly become accessible yet to other departments of science.

Bearing in mind all that is known to-day of the development and succession of vertebrate life in America, from the early Silurian on to the present time, it is safe to say that the faunal break as now known between the Laramie and the lower Wahsatch is far more profound than would be the case if the entire Jurassic and the Cretaceous below the Laramie were wanting. Consequently, every discovery that throws light on this dark region of the geological section has an importance beyond its intrinsic value. In mammalian life, the record here is especially imperfect, and every addition should be welcome.

The Allotheria.

The most important mammalian remains so far discovered in the Ceratops beds of the Laramie belong to the group which the writer has called the *Allotheria*.* Members of this group are known also from both the Triassic and Jurassic, and their presence in the Cretaceous was, of course, to be expected. Several hundred specimens have now been found, indicating quite a number of genera and species, but the correlation of these remains is as yet a matter of great difficulty. The individual teeth are most of them in excellent preservation, and, in a few cases, several are in position in the jaw, but accurate determination of many of the forms must depend upon the results of future discovery. The isolated specimens now known, taken together, or the corresponding parts when compared with each other, all prove the abundance and variety of this group during Cretaceous time; yet it seems much more profitable at present to indicate the main variations in these specimens rather than attempt reconstructions of animals to which they may be imagined to belong.

As is usually the case with fragmentary remains of small mammals, the lower jaws are best preserved, and readily recognized. The lower teeth seem less rare in the Laramie than any other portions of the skull or skeleton, and as they are especially characteristic in the *Allotheria*, must be used largely in the present investigation.

* This Journal, III, vol. xx, p. 239, 1880.

The Lower Teeth.

Among the many lower incisors of this group found in this horizon, three well-marked types, at least, may be distinguished, as follows:

The striate forms, which have the inner face flattened to meet its fellow, and the entire crown covered with enamel. This type is figured on Plate III of Part I, and Plate VIII of Part II. Another is shown on Plate VI, figure 5, of the present paper, and there are several others.

The second series is somewhat smaller in size, with the crown also covered with enamel, but it is compressed, and irregularly bevelled on the concave side, somewhat like the lower incisors of *Hypsiprymnus*. One of these teeth is represented on Plate IV, Part I, and another is shown below, Plate V, figure 4. The enamel is very thin, and easily lost.

A third type, smaller than the above, is more abundant. It is slender, considerably curved, and the outer face only is entirely covered with enamel. This type is seen on Plate VIII, Part II, and in figure 4, Plate VI, below.

A fourth type, which may pertain to the upper series, is similar to the second, but has one margin serrate. This form is shown on Plate VII, Part II. A modification of it occurs in smaller forms, one of which is shown in Plate VII, figure 2, below. The lower incisors of some of the existing shrews (*Sorex*) are notched on the outer margin in a somewhat similar manner.

In all the *Allotheria* of this horizon, the first and second lower premolars are apparently wanting. Only the third and fourth have been found in place. The third when present is very small, and cylindrical, with a single root. The fourth is very large, with two unequal roots, and with a compressed, cutting crown. As a rule, this crown is very low, its summit being elevated but little above the true molars behind it. This is an unexpected feature, as the Jurassic forms below and those in the Tertiary above both have the cutting fourth premolar elevated high above the molar series.

In the known Cretaceous forms, the crown of this tooth shows wide variations, indicating several distinct genera and species. In one series, the summit is deeply notched, and strong ridges cover the greater part of the outer and inner faces. In another, the superior notches are smaller or wanting, and the surfaces of the two sides are marked by a larger number of ridges and grooves. In some of these forms, the crown is very low, not more than half as high as long.

In a second series, the whole premolar is smooth, the sides being without distinct grooves or ridges. This type of premolar is found in several forms, which differ much in other features.

The lower molars are as usual two in number, and although differing widely in the form and structure of their crowns, have only two parallel series of crescents or tubercles, an outer and inner row, with a groove or valley between them.

The Upper Teeth.

The upper dental series of the *Allotheria* of this horizon is much more complicated than the lower series, and as the teeth known are nearly all isolated, or with only portions of jaws attached, their relation to the inferior teeth is at present hardly more than a matter of probability. Some of the larger forms certainly have two, if not three, upper incisors, and the main one is deeply notched at one or more points, as in the genus *Allodon* of the American Jurassic.

The upper premolars that can be placed with certainty are in most cases compressed in form, and evidently met the cutting fourth premolar below. Most of these upper cutting teeth secured, however, pertain to the smaller forms, making it very probable, at least, that in the large species, the upper premolars were not much compressed, and had in themselves no cutting function. This was certainly true, also, in some of the smallest forms; as in *Allacodon pumilus*, the premolars are all known, and in one of the specimens figured, three of them are in place (Plate VII, figure 3).

The upper molars of the group now known from this horizon are of special interest. Although not found in position in any one specimen, so many have been secured with portions of the jaw attached, that their place in the dental series has been ascertained in several forms. All these have apparently but two true molars, the penultimate being in some cases of smaller size than the last.

The upper molar teeth may be separated into two series, the first having three longitudinal rows of elevations on the crown, and the second series but two rows. The various modifications of these types are numerous, and certainly indicate many distinct forms. In some of these, the prominences in each of the three rows are conical, and each row is complete, especially in the last molar. Another type has the three rows complete also,

but the elevations are crescentic, with the convexity forward. In a third series, the two outer rows are composed of tubercles, and the middle one of crescents only. In the smaller upper molars, the middle row and the outer one are complete, but the inner row is less developed. In the second series, where the true molars have but two rows of elevations, these are either conical, or distinctly crescentic, the former being especially seen in the smaller forms.

Among the very large number of *Allotheria* teeth found in the localities explored, not one has yet been secured corresponding to the molar described by Cope, and referred with the type to *Meniscoessus*. The nearest approach to it is the upper molar described by the writer in Part II, as the type of *Selenacodon brevis* (Plate VII, figures 9–12), and this tooth is smaller in size. The two specimens are from widely distant localities, and perhaps from distinct horizons. In the molar described by Cope, one end of the crown was lost, and this fact was stated in the original description, and shown in the first figure published.*

The various *Allotheria* remains represented in the accompanying plates include several that appear to be different from those previously described, but in view of their fragmentary nature, some have been referred to species already named. The material now secured, when fully investigated, will test the accuracy of these references. A few of the smaller forms which appear to be quite distinct are briefly described below, and their main characteristics shown in the plates; accurate figures being the best description, as every paleontologist knows.

Cimolodon parvus, sp. nov.

One of the smallest forms of this genus is represented by various isolated remains, among which is the anterior portion of a lower jaw with the incisor in place, which may be regarded as the type. This specimen is shown on Plate VI,

* Prof. H. F. Osborn has since given a figure of this tooth, which represents the crown as complete (Am. Nat., July, 1891, p. 598). In the same paper, he has a figure of the skull of *Bolodon*, of Owen, which is even more misleading. This figure is made by putting together two different specimens not found associated, and adding a strongly marked suture, which neither shows. Nothing is said in the text in explanation of these indefensible reconstructions, which are mild examples compared with other composite work in the same article, made out of specimens I have described. Such use of my original figures, without permission, while my preliminary work was still in progress, cannot be justified.

On the same page with the *Bolodon* figure is another of a supposed premolar, which, as I have shown elsewhere (Proc. Ac. Nat. Sci. Phila., 1891, p. 240), is almost certainly made up of portions of *Hybodus* fish teeth. Additional evidence on this point makes it sure that other similar specimens are in existence, and also suggests that the type of *Triglyphus* may be a like production.

figure 4. A number of separate incisors and molar teeth, some with pieces of the jaw attached, were found at the same locality, and one of the molars is represented on the same plate, figure 6. The incisor in the type is much compressed, and has its inner face concave. The symphysis of the jaw is very small, and situated on a distinct elevation. The molar tooth shown in figure 6 is from the lower series, and apparently the penultimate. The cusps are tubercular, and there is a deep median groove between the two rows.

This species is about half the size of *Cimolodon nitidus*, a molar of which is shown on the same plate, figure 7, and a lower jaw, in figure 9. The latter specimen is of special interest, as it shows the smooth fourth premolar in place, with the summit of the crown on a level with the two molar teeth behind it.

These specimens are all from the Laramie of Wyoming.

Cimolodon agilis, sp. nov.

The smallest species of this genus is represented by various remains, the most important of which is the left lower jaw, shown on Plate VI, figure 8, which is here taken as the type specimen. The penultimate molar is in place, and its position is so far back that its posterior margin is opposite the front of the coronoid process. The last molar, when present, was entirely concealed by this process when seen from the outside. The molar preserved has the two rows of tubercles close together, with only a valley between them.

This specimen, which belonged to an animal the size of a mouse, was also found in the Laramie deposits of Wyoming.

Allacodon fortis, sp. nov.

Since the genus *Allacodon* was established by the writer, in Part II, many additional specimens have been secured, so that the entire upper series of molars and premolars, at least, is believed to be known. Of these teeth, there are three distinct sizes, representing as many species. The largest of these is undescribed, and the tooth shown in Plate VII, figure 4, one of the most characteristic, may be taken as the type. It is evidently an upper premolar corresponding to the middle one in the jaw of *Allacodon pumilus* represented on the same plate, figure 3.

The upper teeth in this genus, besides those figured, have either five or six cones on the crown, and are evidently molars, showing that this genus is closely allied to *Allodon* of the Jurassic, described by the writer.

The lower teeth of the present genus are not known with certainty. The specimens here figured are from the Laramie of Wyoming.

Allacodon rarus, sp. nov.

Among the specimens above described a few isolated teeth were found, one of which is represented in Plate VII, figure 5, and may be provisionally referred to the genus *Allacodon*. It is a molar tooth, with four rounded tubercles on the crown, yet these are not crowded together as in the known species of this genus, but the anterior and posterior pairs are separated by a deep transverse groove, showing a distinct type of tooth. This is well shown in the figures given. Additional specimens must determine its nearer affinities.

Oracodon conulus, sp. nov.

The teeth of this genus have well marked characters, but none have yet been found in position, or so associated with other remains as to afford any evidence of where they really belong. Although their general features are distinctive, there are various forms and sizes among those now known. The two teeth shown on Plate VII, figures 6 and 7, agree substantially with the type specimen of *Oracodon anceps*, described in Part II. A somewhat larger form, represented in Plate VII, figure 8, appears to be different, and is taken as the type of the species here regarded as new. Its important characters are well shown in the figure.

The teeth figured appear to be upper premolars, and one of them shows a worn surface on the inner side of the crown. They are here placed with the *Allotheria*, and a fortunate discovery may at any time prove their proper position among the varied remains of this group.

The Stagodontidæ.

A large number of specimens belonging to this family have been discovered since the first were described. These are quite distinct from any other remains from this horizon, and several of them are figured on Plate VIII, with the type specimens of the two species of *Stagodon* previously made known. Some of the new fossils indicate the largest mammal yet found in the Laramie, and this is described below.

Stagodon validus, sp. nov.

The type of the present species is the anterior portion of a right lower jaw represented on Plate VIII, figure 7. This shows alveoles for three incisors closely crowded together, the

first, or inner one, being much the largest. A very stout canine (fig. *a*, *c*) was present, and behind it, in close contact, follow two premolars, the second being the larger. These are both much worn, but the surface of the crowns preserved is coarsely striate, or rugose, thus permitting a comparison with various isolated teeth of similar size and structure found in the same deposits. Two of these teeth are shown in the same plate, figures 4 and 5, while a separate canine referred to this species is represented in figure 6.

These specimens taken together indicate a carnivorous animal, which apparently has its nearest living ally in the genus *Sarcophilus*, the only representative of which is the "Tasmanian devil" (*S. ursinus*, Cuvier). The resemblance of the present type specimen to the corresponding part of this living marsupial is close.

The teeth of the smaller species of *Stagodon* shown on the same plate appear to be all upper premolars, and each has two roots. The crowns of those best preserved show indications of the same rugose markings seen on the larger lower teeth, and all other features prove their close affinity with them.*

The Cimolestidæ.

The remaining specimens figured on the accompanying plates (IX–XI) include various fossils belonging to the family *Cimolestidæ*, which appear to be certainly marsupials more or less related to the modern opossums. Beside these, however, there are quite a number of remains which show features of the *Insectivora*, but until more perfect specimens are obtained, their true affinities must remain in doubt. Under these circumstances, some of these fossils have been referred to forms previously made known in Parts I and II, and only the most distinct and best preserved specimens are described as new. It is believed that the material already secured, when properly worked out of the matrix and investigated, will remove most of the uncertainty now remaining in regard to several typical forms already in part made known.

The larger forms most nearly allied to the genus *Didelphys* are not abundant, but their size has kept some of the remains in good preservation. There are several distinct species of these, but at present they are known only from imperfect material, mostly isolated teeth.

* Prof. Osborn in the paper already quoted has questioned the mammalian nature of the type of this genus, without giving any evidence for such an opinion. In a later paper (Am. Nat., p. 780, 1891), he has even placed in the *Stagodontidæ*, as my types, figures of quite different fossils. No reply is necessary, as the specimens shown on Plate VIII tell their own story to every anatomist.

The smaller forms, including the genus *Cimolestes* and its near allies, are less rare, and thus admit of more accurate determination. Of these forms, there are at least three genera, which may be readily separated from the specimens now known. *Cimolestes*, which has in the lower jaw seven teeth behind the canine, forming a close series without diastema; *Batodon*, with four premolars separated from each other; and *Telacodon*, an allied form, with five lower premolars. The upper molar teeth referred provisionally to these genera have also marked characters, as shown in the various figures representing them, but more perfect specimens must settle the question of their exact relations to each other.

Telacodon lævis, gen. et sp. nov.

The type specimen of this genus is the right lower jaw figured on Plate IX, figure 3. It contains three premolars in good preservation, and has alveoles for two more between these and the canine. An upper premolar referred to this species is shown in figure 2, and an upper molar, also referred provisionally to this form, is given on Plate XI, figure 1. Their exact relation to each other is, of course, uncertain. They are all from the same locality, although not found closely associated.

A second species, somewhat larger in size, is represented by several specimens, one of which, the lower jaw shown on Plate IX, figure 4, may be taken as the type. The lower molar represented on Plate XI, figure 8, is referred to the same species with doubt. This species may be called *Telacodon præstans.*

All the remains of this genus so far as known are from the Laramie of Wyoming.

Batodon tenuis, gen. et sp. nov.

The present genus is represented by several specimens, of which the lower jaw on Plate XI, figure 5, may be regarded as the type. In this specimen, the canine is in position. It is comparatively large, and directed well forward. Just behind the canine, there was a very small premolar, not preserved. Following this are two others with low compressed crowns pointing forward. The fourth premolar is quite large, with the crown standing high above the jaw, as shown in the figure. In Plate X, figure 6, a right lower jaw is shown, which may be referred to the same species. It has the last two molars in place, well preserved. An upper molar shown on Plate XI, figure 2, is likewise referred to the present species.

All the known remains are from the Laramie of Wyoming.

One of the most interesting isolated teeth found is represented on Plate XI, figure 9. Several others with the same structure of crown have been secured, but most of them are much more worn. All are evidently deciduous, and they were associated with the teeth of *Didelphops*. There can be little doubt that they are the milk-teeth of the last premolar, and probably pertain to that genus. The discovery of these teeth is of special interest, as it connects the Cretaceous forms with existing Marsupials.

The only specimens described in this series of papers in regard to the nature of which any reasonable doubt can be suggested are the small *Platacodon* teeth the crowns of which are figured in Part II, Plate VIII. In form, these are certainly like the crowns of some fish-teeth, but the best authorities on the subject who have examined them do not consider them such. They were found associated with characteristic mammal teeth, some of which they closely resemble, especially various small incisors, one of which entire is represented on Plate XI, figure 7. A microscopic examination will determine the true nature of the type.

The specimens described and figured in the present article all belong to the skull, the teeth being especially characteristic, and best preserved. Associated with these, likewise, were many parts of the skeleton, especially vertebræ, and bones of the limbs and feet. Some of these specimens were illustrated in Part I, Plate V, and many others will be discussed in a later communication. The bones of the skeleton now known confirm the conclusion derived from the teeth, that many genera and species are represented in the collections made. Some of the broader generalizations suggested by the preliminary study of these remains are of special interest in connection with those already presented, but cannot be given here. One or two facts, however, may be mentioned. All the pelvic bones thus far found have been separate. This is true not only of those of young animals, but of some others apparently adult. The bones of the feet, moreover, indicate that the specialization so marked in the dentition of some of these early mammals was not confined to the skull, but in one or more forms, at least, had made equal progress in the extremities.

For the rare and important material on which the present communication is based, the writer is again mainly indebted to his able assistant, Mr. J. B. Hatcher, whose field-work in vertebrate paleontology has never been surpassed, and will be appreciated more fully as the results of his explorations are placed on record.

Postscript.

After Parts I and II of the present series were published, I made a communication on the subject before the British Association, at the Leeds meeting, Section D, September 5, 1890. The title of the paper was "On the Cretaceous Mammals of North America." These were fully discussed so far as then known, and a series of specimens of the principal forms discovered was exhibited to the section, and shown to many other members interested in the subject. An abstract of this paper will be found in the Report of this meeting, p. 853, 1891.

The first announcement of Mammals in the Cretaceous of Europe has recently been made before the Zoological Society of London, November 17, 1891, by Smith Woodward, of the British Museum, who described a single molar tooth from the Wealden of Hastings, under the name *Plagiaulax Dawsoni*. An abstract is given in Nature, p. 164, December 17, 1891. It seems strange that discoveries of similar remains have not been made before in the Wealden, but now others will probably follow. A more promising field is in the fresh-water Gosau beds of Austria, where the *Ceratopsidæ* occur, and other fossils allied to those in the Laramie. When a student in Germany, years ago, I searched in them myself for mammals, without success, but have ever since been expecting that some one would announce the discovery.

In this country, the discoveries of Cretaceous Mammals as announced by me in 1889 were not altogether approved by Prof. H. F. Osborn, who, while my investigation was still in progress, wrote a criticism of the two parts already issued, although he had seen none of the specimens described. This review was read before various scientific bodies, among them the Philadelphia Academy of Natural Sciences, to which it was presented January 20, 1891. Part of it was accepted for publication, and appeared in the Proceedings, pp. 124–135, 1891. I received a separate copy March 13, 1891, but had previously heard the review read by Prof. Osborn at the Biological Society of Washington, February 7, 1891. At this meeting, I exhibited a series of specimens of Cretaceous mammals that disproved the main points then asserted by Prof. Osborn, but he declined to examine them.

The review as subsequently published was discourteous, unjust, and erroneous in so many points, that I prepared a short reply under the title "Note on Mesozoic Mammalia," and sent it to Dr. Leidy, President of the Philadelphia Academy, who presented it to that society April 14, 1891, and informed me that it would soon be printed. As chairman of

the committee of publication, he gave me full permission to publish it separately, duly credited to the Academy, and a few copies were thus printed, and sent to Europe. The sudden death of Dr. Leidy delayed publication by the Academy, but the paper appeared in the Proceedings, pp. 237–241, 1891, essentially as presented, the main alterations being verbal changes, the result of editorial supervision. Separate copies had previously been printed by the Academy, and distributed by me.

Prof. Osborn next had his original review as offered to the Philadelphia Academy published in full in the American Naturalist for July, 1891, and with it my reply as presented to the same Academy, except under a somewhat different title. To the latter article, he prepared the rejoinder read before the American Association at Washington, August 21, 1891, published it in the American Naturalist for September, 1891, and issued revised, separate copies. In this paper, Prof. Osborn attempts to answer the criticism upon his review and previous work on Mesozoic mammals, and repeats a number of statements made in his original review, and since shown to be erroneous. The value of such extensive publications without examination of a single specimen described may be fairly questioned. The record of them above presented is for the benefit of those especially interested in the subject.

New Haven, Conn., Feb. 23, 1892.

Explanation of Plates.

Plate V.

Figure 1.—Upper cutting premolar of *Cimolomys gracilis*. Marsh.
Figure 2.—Upper molar of *Tripriodon caperatus*. Marsh.
Figure 3.—Right upper molar of *Tripriodon cœlatus*. Marsh.
Figure 4.—Left lower incisor of *Halodon sculptus*, Marsh, in position in jaw.
Figure 5.—Right lower fourth premolar of same species.
Figure 6.—Worn molar of *Dipriodon lunatus*. Marsh.
Figure 7.—Right lower jaw of *Dipriodon lunatus*, with third and fourth premolars and first molar in place. Natural size.

Plate VI.

Figure 1.—Upper incisor of *Dipriodon lunatus*.
Figure 2.—Upper premolar of *Nanomyops* (*Nanomys*) *minutus*, Marsh.
Figure 3.—Upper molar of *Cimolodon nitidus*, Marsh.
Figure 4.—Left lower incisor of *Cimolodon parvus*, Marsh, in position in jaw.
Figure 5.—Lower incisor of *Selenacodon*.
Figure 6.—Molar of *Cimolodon parvus*.
Figure 7.—Molar of *Cimolodon nitidus*.
Figure 8.—Lower jaw of *Cimolodon agilis*, Marsh, with penultimate molar in place.
Figure 9.—Right lower jaw of *Cimolodon nitidus*, with cutting premolar and last two molars in place.

Note.—In all the plates. Figure *a* is natural size. The figures enlarged have the increase in size given in diameters over each cut.

PLATE VII.

FIGURE 1.—Incisor of *Cimolomys gracilis.*
FIGURE 2.—Incisor of *Cimolomys bellus*, Marsh.
FIGURE 3.—Upper jaw of *Allacodon pumilus*, Marsh, with three premolars in place.
FIGURE 4.—Upper premolar of *Allacodon fortis*, Marsh.
FIGURE 5.—Upper molar of *Allacodon rarus*, Marsh.
FIGURE 6.—Upper premolar of *Oracodon anceps*, Marsh.
FIGURE 7.—Upper cutting premolar of same species.
FIGURE 8.—Upper premolar of *Oracodon conulus*, Marsh.

PLATE VIII.

FIGURE 1.—Premolar of *Stagodon nitor*, Marsh. (Type.)
FIGURE 2.—Premolar of same species, with roots more distinct.
FIGURE 3.—Upper premolar of *Stagodon tumidus*, Marsh. (Type.)
FIGURE 4.—Premolar of *Stagodon validus*, Marsh.
FIGURE 5.—Premolar of same species.
FIGURE 6.—Left lower canine of same.
FIGURE 7.—Right lower jaw of *Stagodon validus*, showing canine and two premolars in place.

PLATE IX.

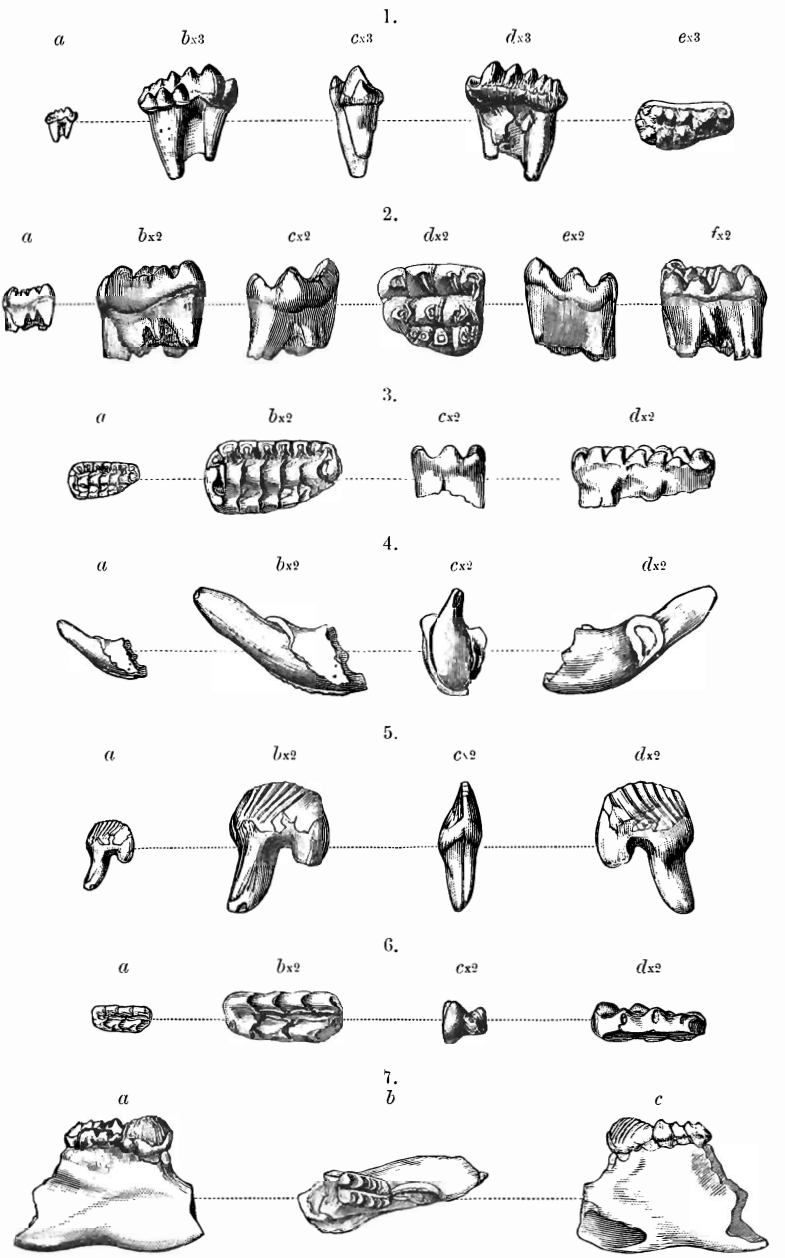
FIGURE 1.—Two right upper molars of *Didelphops vorax*, Marsh, in position in jaw.
FIGURE 2.—Upper premolar of *Telacodon lævis*. Marsh, in jaw.
FIGURE 3.—Lower jaw of *Telacodon lævis*, with three premolars in place, and alveoles for two others.
FIGURE 4.—Lower jaw of *Telacodon præstans*, Marsh.
FIGURE 5.—Left lower jaw of *Cimolestes incisus*, Marsh; outside view.
FIGURE 6.—The same jaw; inside view.
FIGURE 7.—Right lower jaw of *Didelphops ferox*, Marsh; seen from above.
FIGURE 8.—The same jaw; seen from the inside. Both figures natural size.

PLATE X.

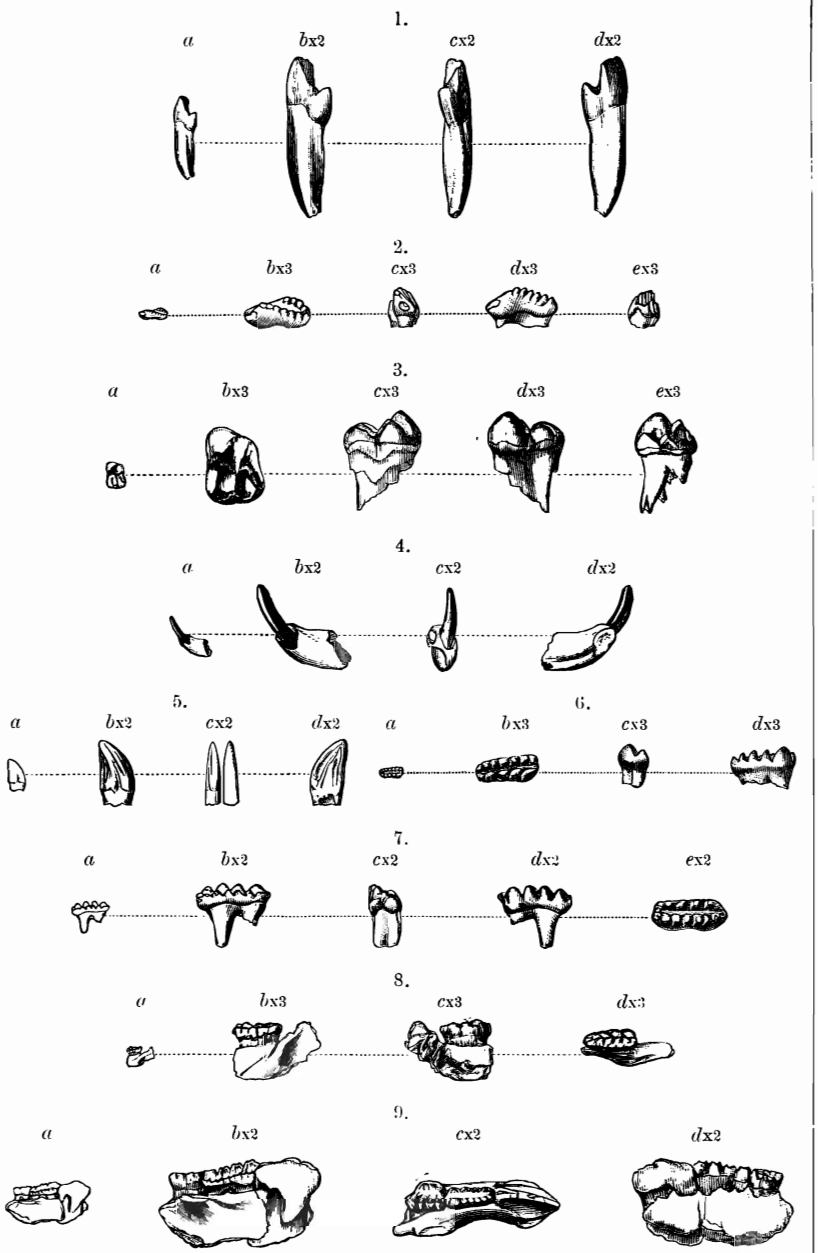
FIGURE 1.—Upper molar of *Didelphops comptus*, Marsh.
FIGURE 2.—Upper premolar of same species.
FIGURE 3.—Upper molar of *Pediomys elegans*, Marsh.
FIGURE 4.—Premolar of same species.
FIGURE 5.—Lower molar of *Cimolestes incisus.*
FIGURE 6.—Lower jaw of *Batodon tenuis*, Marsh, with last two molars in place.
FIGURE 7.—Left lower jaw of *Pediomys elegans*, with last molar in place.

PLATE XI.

FIGURE 1.—Upper molar of *Telacodon lævis.*
FIGURE 2.—Upper molar of *Batodon tenuis.*
FIGURE 3.—Lower molar of same species.
FIGURE 4.—Canine tooth of *Cimolestes.*
FIGURE 5.—Lower jaw of *Batodon tenuis*, with premolars and canine in place.
FIGURE 6.—Tooth of *Platacodon nanus*, Marsh.
FIGURE 7.—Lower incisor of same species.
FIGURE 8.—Lower molar of *Telacodon præstans.*
FIGURE 9.—Milk-tooth of *Didelphops.*



AMERICAN CRETACEOUS MAMMALS.



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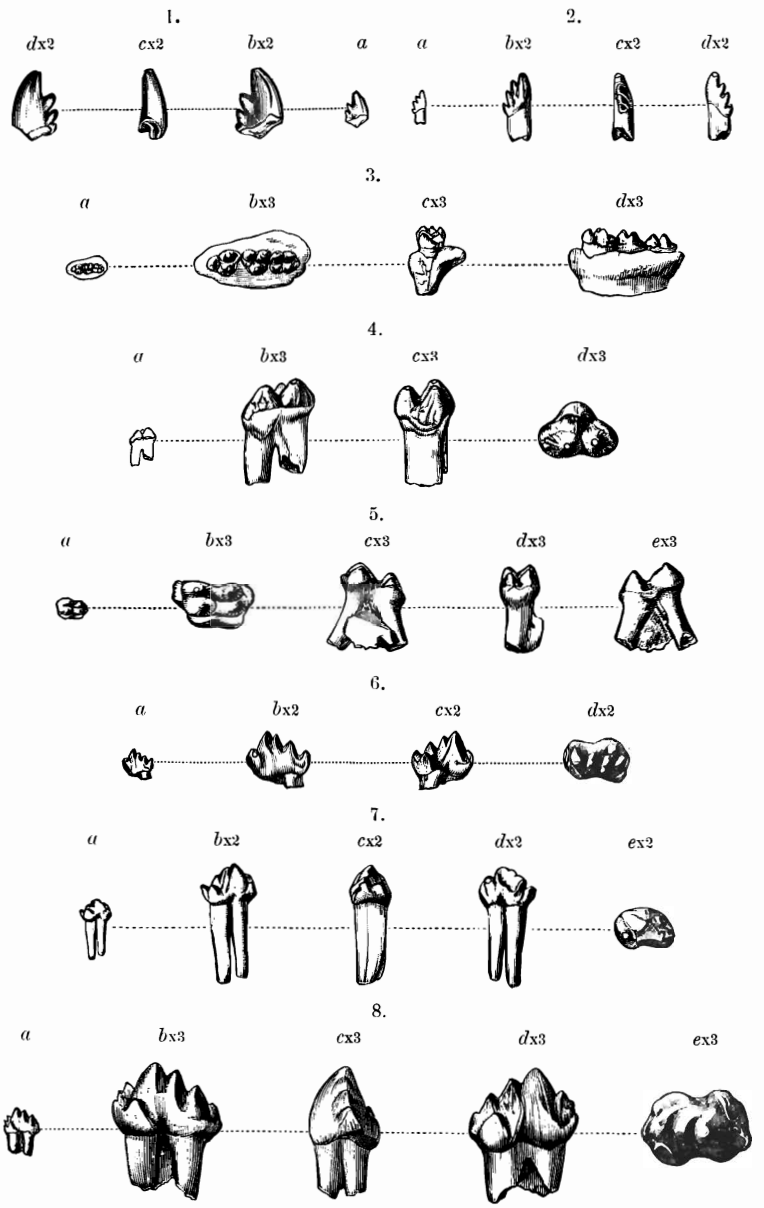

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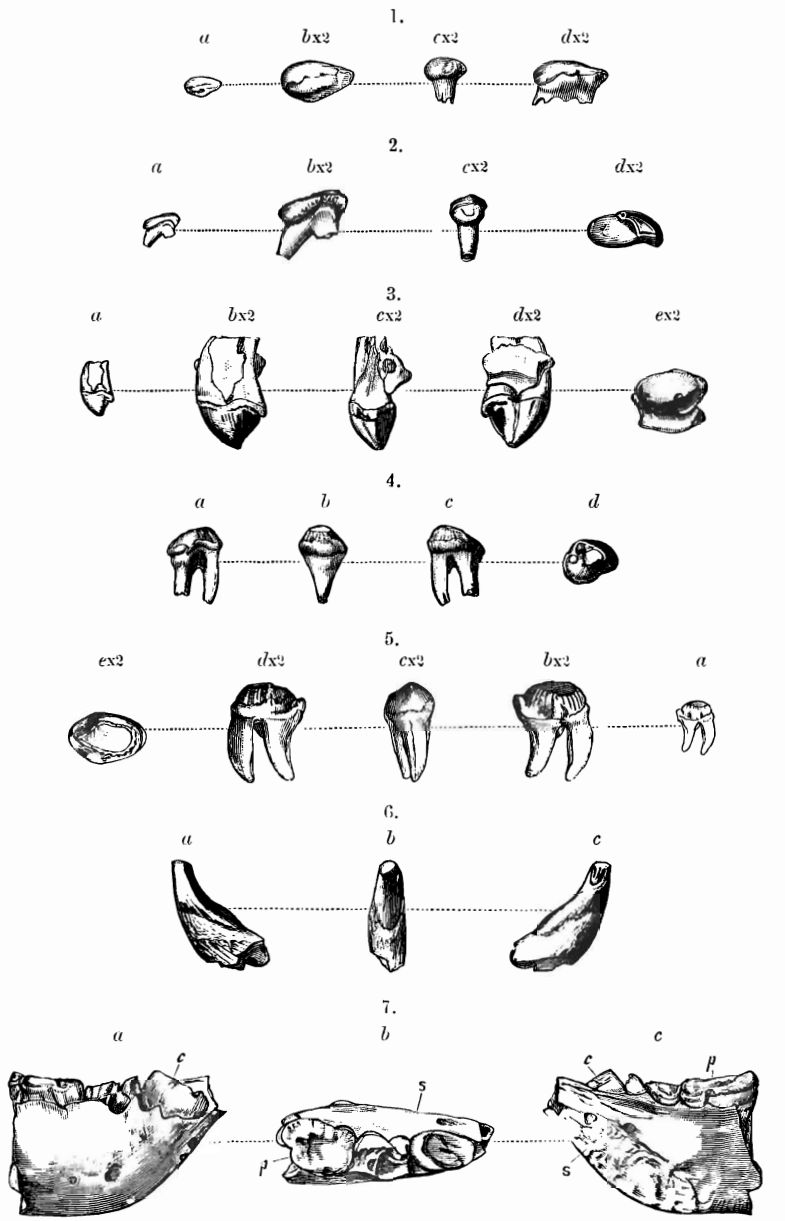

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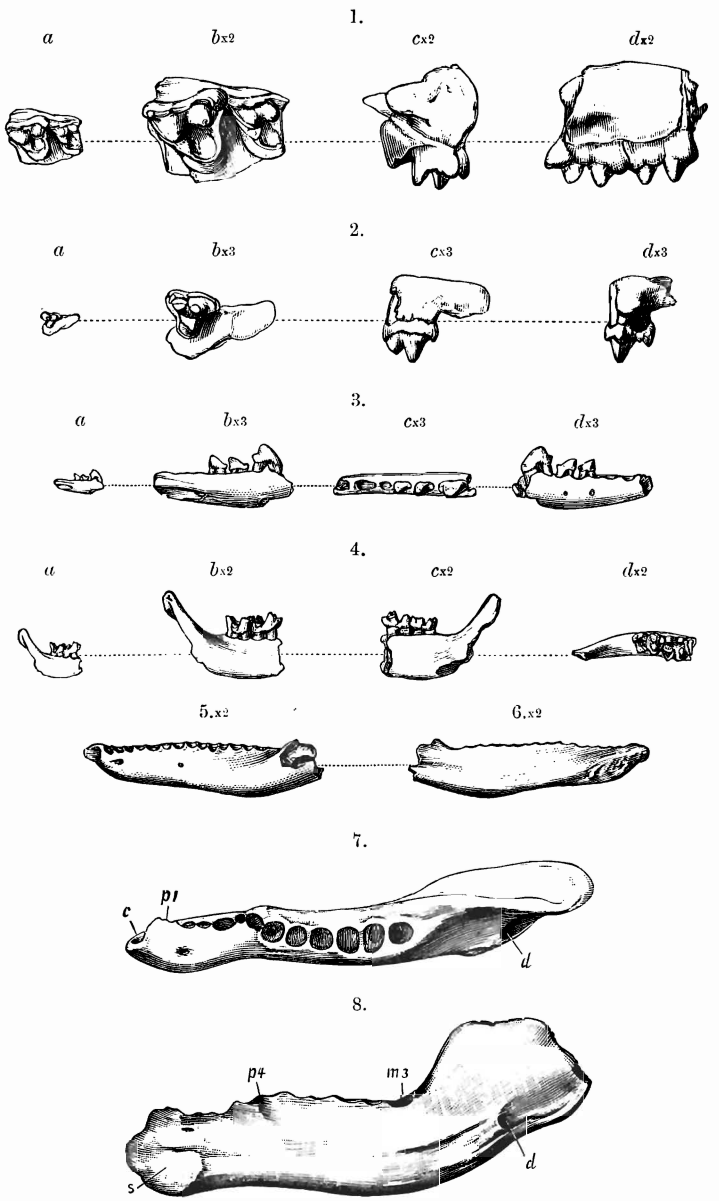

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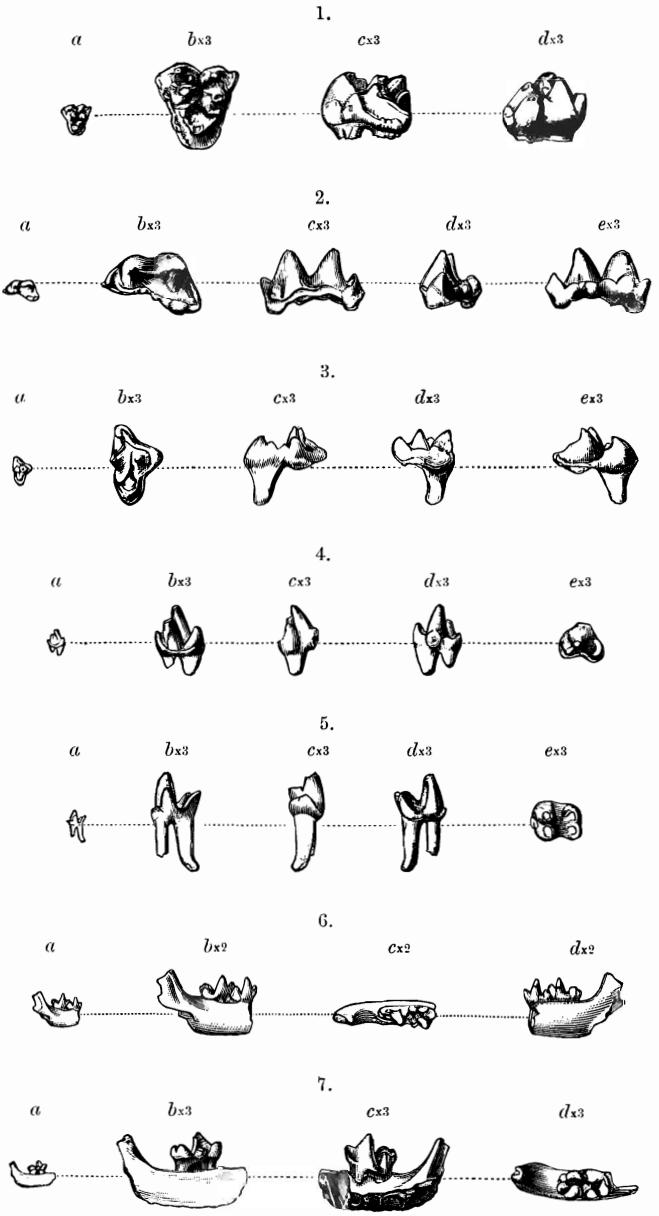

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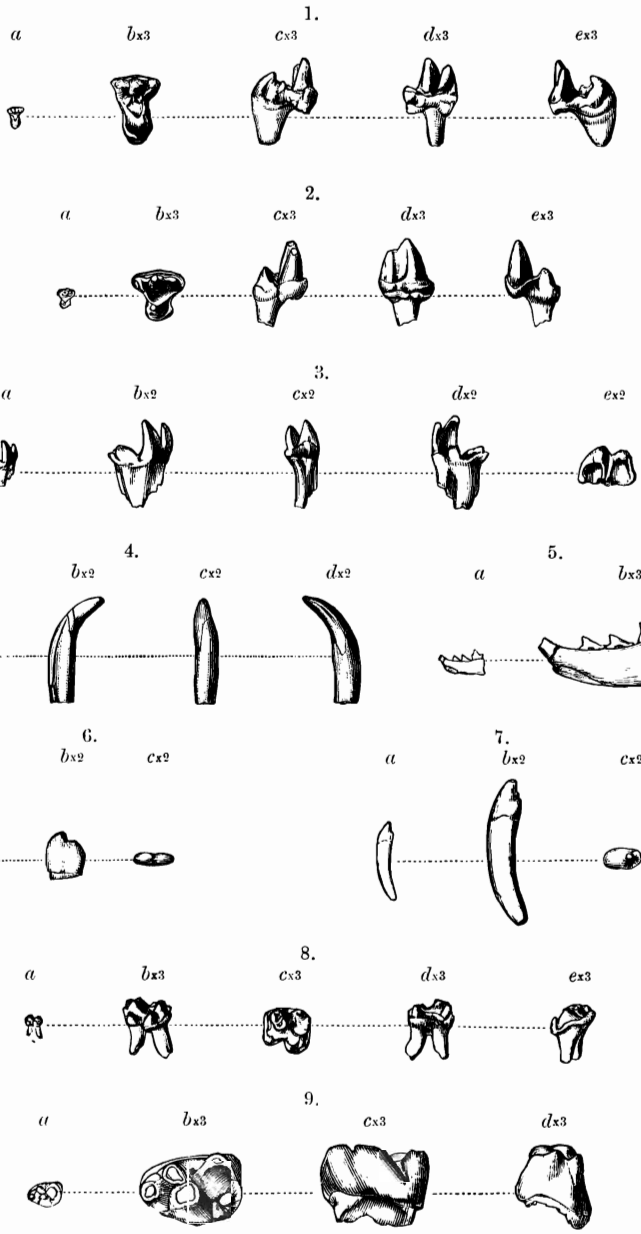

AMERICAN CRETACEOUS MAMMALS.