A

MANUAL OF PALÆONTOLOGY

FOR THE USE OF STUDENTS

WITH A GENERAL INTRODUCTION ON THE
PRINCIPLES OF PALÆONTOLOGY

BY

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Family Rhinocerotidæ.—With this family we enter upon the consideration of another branch probably derived from the primitive Lophiodont stock, which attained great development in Tertiary times, and is still represented in Asia and Africa by at least five well-defined species. It is not easy to distinguish this family from the *Lophiodontidæ*, as represented by *Hyrachyus* (which Dr

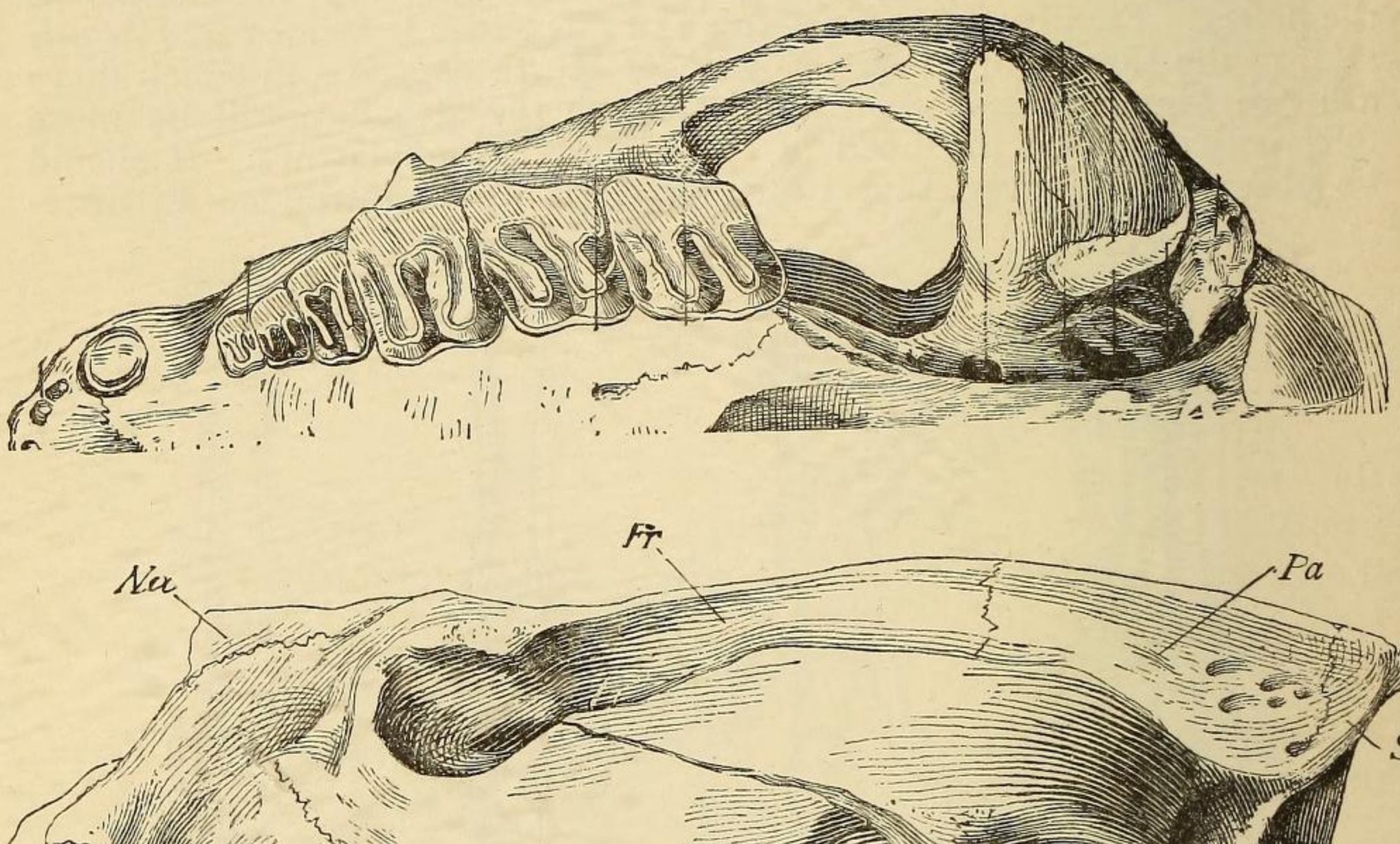

Fig. 1237.—Left half of the palatal surface of the cranium, and left lateral aspect of the skull of *Metamynodon planifrons;* from the White River Miocene of North America. One-sixth natural size. *Na*, Nasal; *Fr*, Frontal; *Pa*, Parietal; *So*, Supraoccipital; *sm*, United postglenoid and posttympanic processes; 1, 2, 3, Alveoli of incisors; *c*, Alveolus of canine; 2, 3, 4, Premolars; 1, 2, 3, True molars. (After Scott and Osborn.)

Schlosser includes in the *Rhinocerotidæ*), but the upper true molars (fig. 1239) generally have a very thick outer wall, which is often produced in advance of the first ridge; their transverse ridges are but slightly bent, and are intimately connected with the outer wall; the upper premolars are usually nearly or quite as complex as the true molars; the lower cheek-teeth are more or less completely

crescentoid; and in all the forms in which that tooth is known there is no third lobe to the last lower true molar. The height of the cheek-teeth varies considerably, their crowns being tallest in *Elasmotherium*. One or more dermal horns may be attached to the fronto-nasal region; and when two of these appendages are present they may be either placed one behind another in the middle line, or in a pair on either side of this line. The digits of the pes are apparently always three, but there may be either three or four in the manus. One of the most generalised forms is *Hyracodon*, from the Lower Miocene of Nebraska, in which the dental formula is $I.\frac{3}{3}$, $C.\frac{1}{1}$, $Pm.\frac{4}{4}$, $M.\frac{3}{3}$. There were apparently only three digits; the neck and limbs were slender and Horse-like; and there was no trace of a nasal horn. This genus was in all probability a descendant of the Lophiodont *Hyrachyus*, but does not appear to have been the progenitor of the true Rhinoceroses. In some respects still more generalised is the genus *Amynodon* (*Orthocynodon*), from the Middle and Upper Eocene of North America, in which the dental formula was the same as in *Hyracodon*. The lower canines were nearly upright; there was a short diastema; the premolars were unlike the true molars; and it is believed that the manus had four digits. Allied to this genus is *Metamynodon*, from the Miocene of the United States, in which the skull (fig. 1237) has a strong sagittal crest, the premolars are reduced to $\frac{3}{2}$, the lower canines have become somewhat proclivous, and the upper premolars are much more like the true molars. These two genera are regarded by some of the American palæontologists as indicating a distinct family—the *Amynodontidæ* — and are also looked upon as the ancestors of the true Rhinoceroses. In the Old World there is, however, the genus *Cadurcotherium* of the Quercy Phosphorites, which may possibly lay claim to this position, although it may indicate a lateral branch allied to the Toxodontia. Unfortunately, only detached teeth are at present known, so that the dental formula cannot be determined. The upper true molars (fig. 1238)

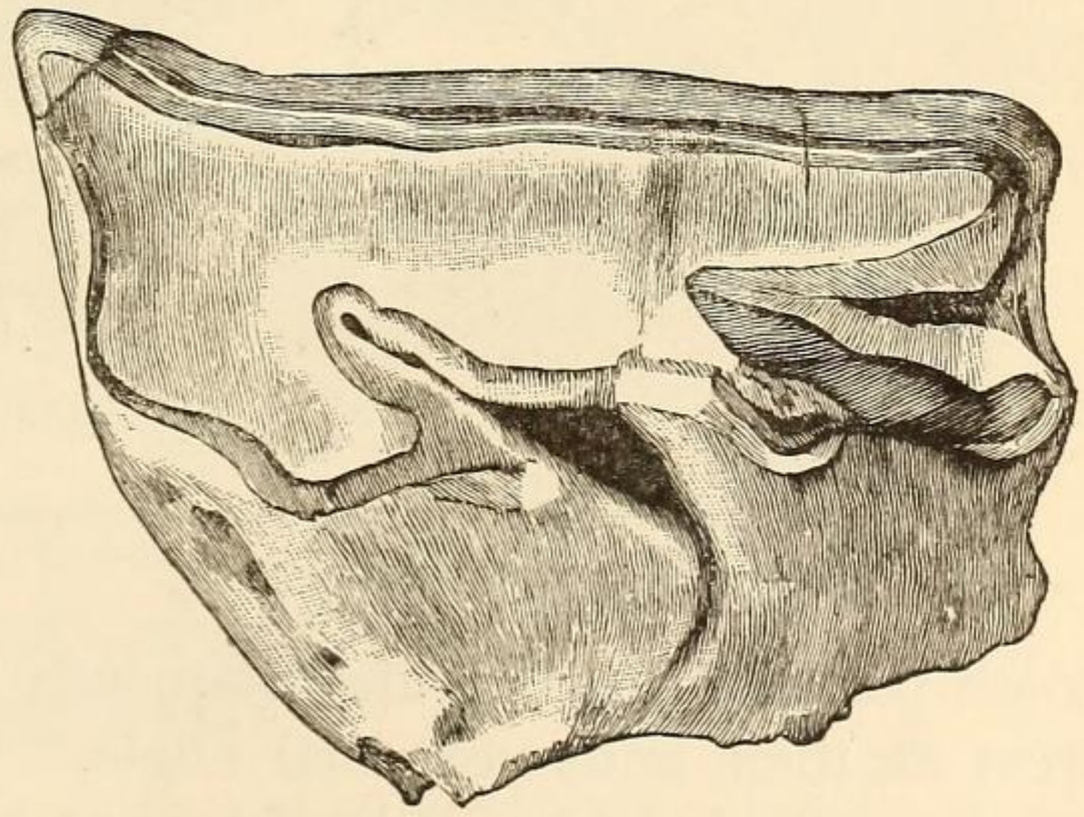

Fig. 1238. — A left upper true molar of *Cadurcotherium cayluxense;* from the Upper Eocene of France.

are Rhinocerotic in structure, but are extremely narrow in a transverse direction, and the ridges of the lower cheek-teeth are imperfectly crescentoid. Apparently nearly related to the preceding is *Homalodontotherium*, from Tertiary strata of unknown age in Patagonia; the dental formula is the typical one, and there is no diastema, but the skeleton is unknown. We now come to the consideration of those animals which we may term true Rhinoceroses—a group in which very diverse views as to the limits of generic terms are prevalent among zoologists and palæontologists. By some writers the five existing species are referred to at least three distinct genera, and if this view be adopted, it will be necessary to make a large number of genera for the extinct forms; the English school, however, now generally include all the living species in one genus, and from this point of view there seems no good reasons for generically separating any of the extinct species, which form a series so intimately connected that it would be very difficult to define all the genera into which they are divided by the American school.[1] Using, then, the term *Rhinoceros* in its widest sense, the variations in the number of teeth may be expressed by the formula $I.\frac{(0-2)}{(0-1)}$, $C.\frac{0}{(0-1)}$, $Pm.\frac{4}{4}$, $M.\frac{3}{3}$; the absence of upper canines is a distinctive feature; the upper true molars (fig. 1239) have their crowns relatively wide, their transverse ridges well developed, the hinder lobe of the last

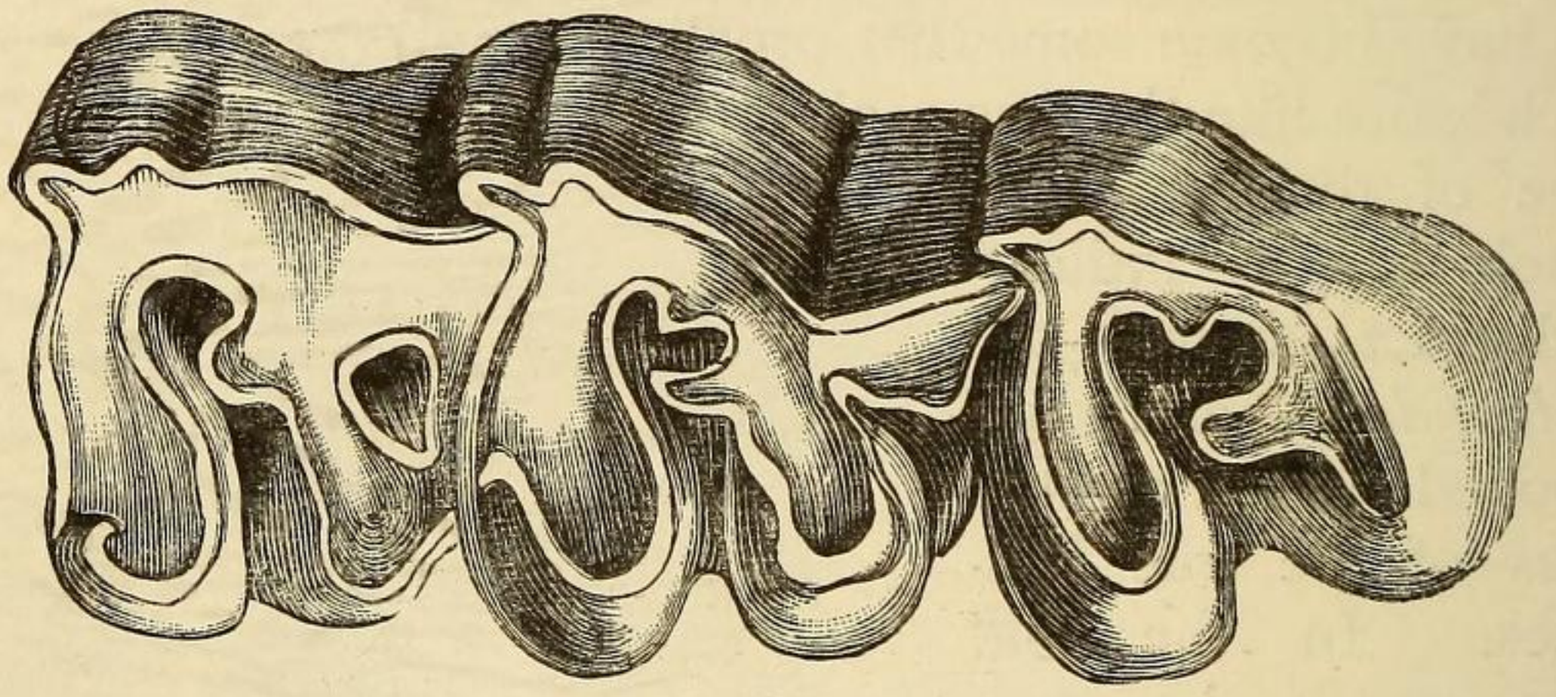

Fig. 1239.—The left upper true molars of *Rhinoceros megarhinus;* from the Pleistocene of England. One-half natural size.

tooth partially aborted, and frequently a more or less distinct buttress at their antero-external angle. The teeth represented in fig. 1239 are the most generalised type; and it is evident that, when more

[1] In this and other instances the number of generic divisions which we may be disposed to adopt is solely a matter of convenience. From the writer's point of view the multiplication of generic terms, which as our knowledge advances must become less and less susceptible of exact definition, tends to drown the science in a sea of names, which form a great burden to the memory, and thus tend to destroy the very object of classification.

worn, the crown of each molar would carry two isolated fossettes surrounded by enamel (fig. 1244). The worn crown-surface is transversely ridged; and there is a process projecting from the hinder ridge into the middle valley termed the crochet, which is absent in some species. The hinder premolars are as complex as the true molars; and the crowns of the cheek-teeth, though varying in height, are never very tall, and their valleys are always open. In the lower cheek-teeth the ridges form complete crescents, with their concavity directed inwardly (fig. 1240). The lower canines are always proclivous. The skeleton and skull are very massive, this feature being most marked in the more specialised species. This genus may be divided into several groups, of which the *Aceratherine* is the most generalised. In this group there is usually no horn, and the nasal bones (fig. 1241) are consequently small; cutting-teeth are always present, although there is some variation

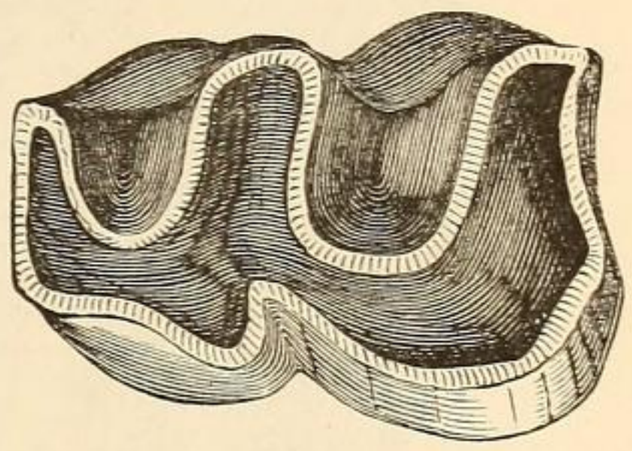

Fig. 1240.—The third left lower true molar of *Rhinoceros megarhinus;* Pleistocene. Two-thirds natural size.

in their number, which may be expressed by the formula $I.\ \frac{(0-2)}{1}$, $C.\ \frac{0}{1}$. In *R. incisivus* (which is the type of the so-called *Aceratherium*) there are four digits in the manus; but in many of the North American forms (which on this account are separated by

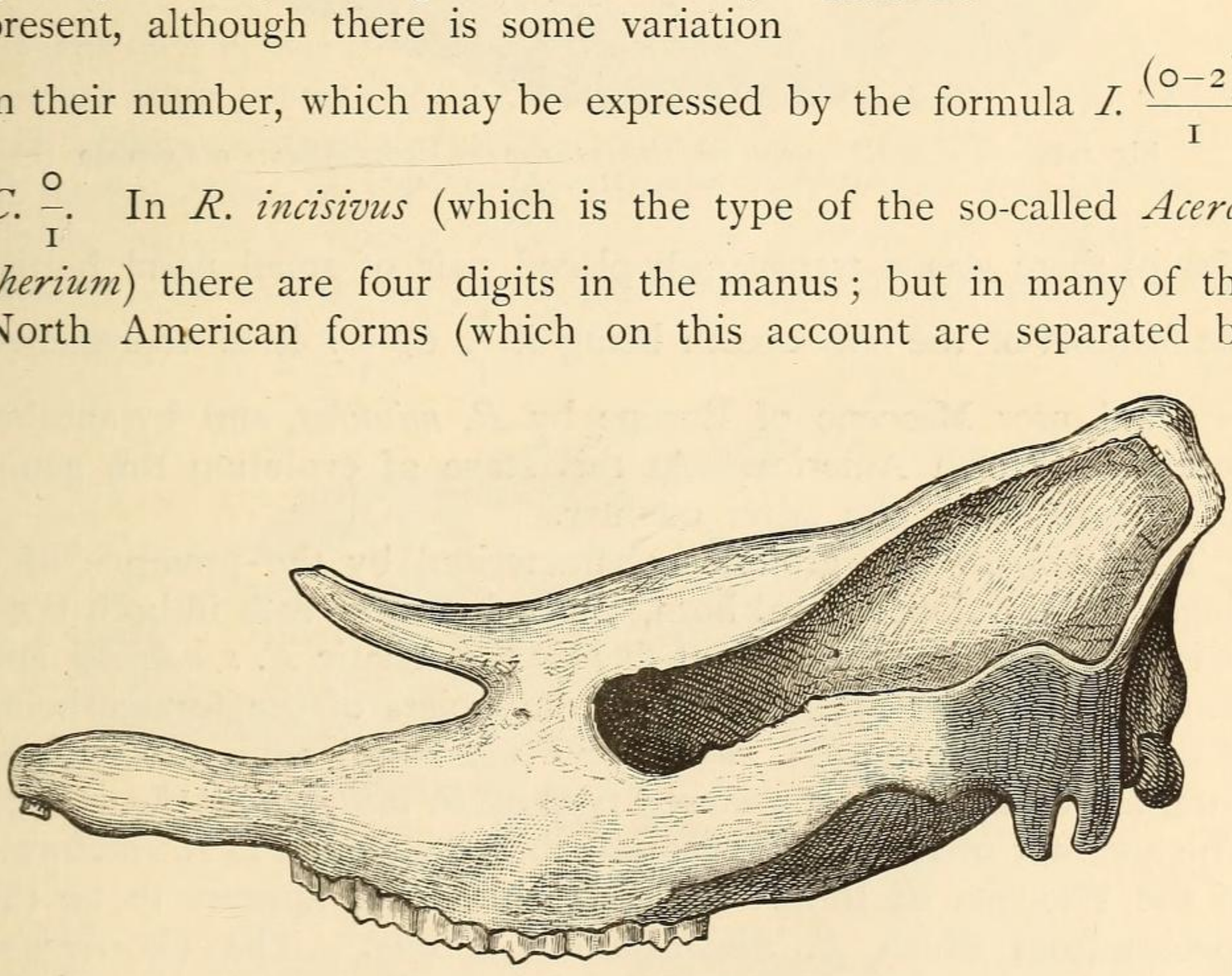

Fig. 1241.—Cranium of *Rhinoceros incisivus;* from the Lower Pliocene of Germany. One-seventh natural size. (After Kaup.)

Professor Cope under the name *Aphelops*, fig. 1242) the number of digits was reduced to three; and these forms were thus similar to some female examples of the existing *R. sondaicus*, in which the horn is absent. In Europe this group ranges from the Lower Mio-

cene to the Lower Pliocene; it also occurs in the Upper Miocene and Pliocene of India, and in the Upper Miocene (or ? Pliocene) of North America. In the *Diceratherine* group (*Diceratherium* of

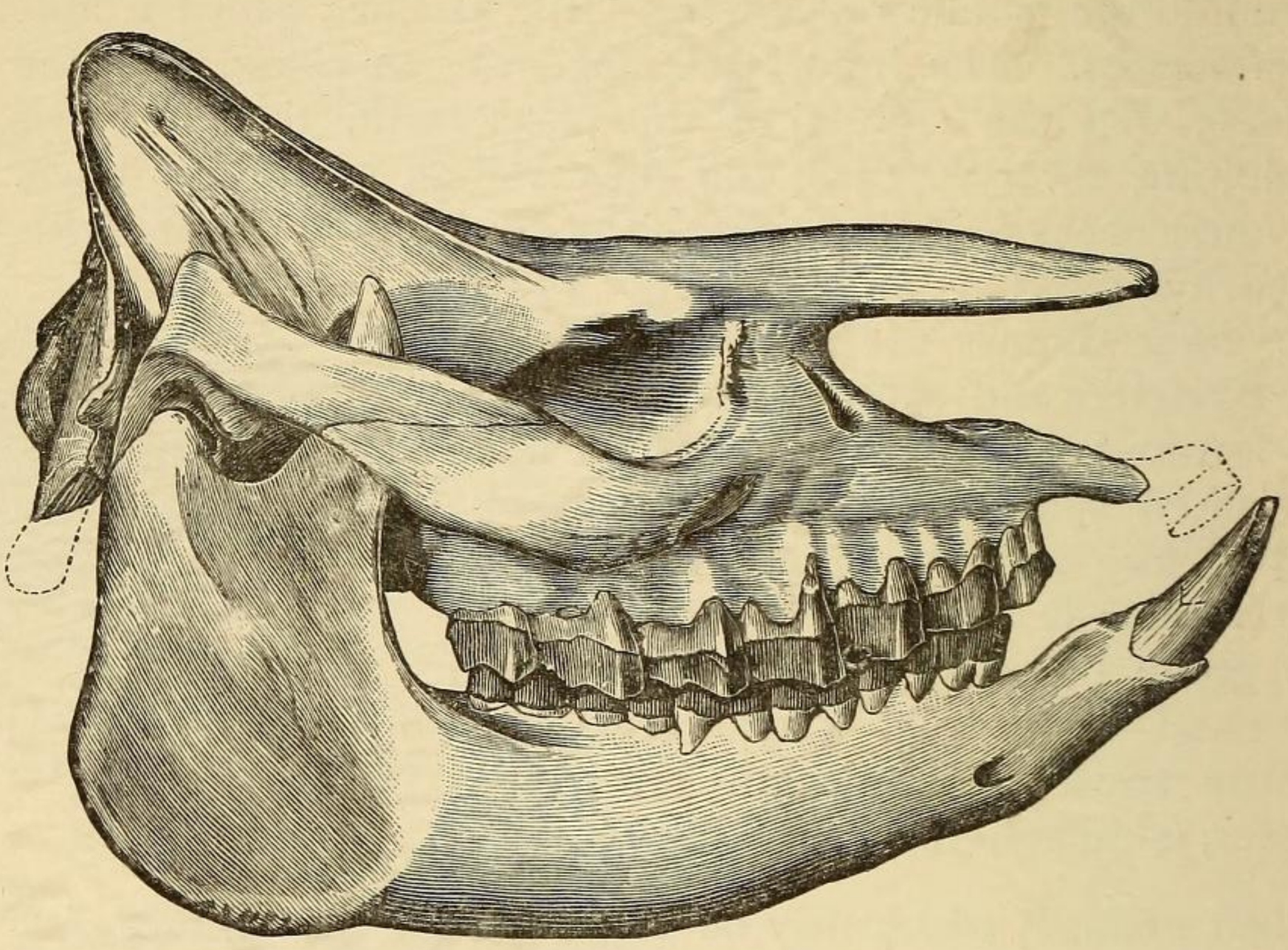

Fig. 1242.—Skull of *Rhinoceros megalodus;* from the Upper Miocene of Colorado. One-sixth natural size. (After Cope.)

Marsh) there was a transversely-placed pair of small nasal horns; the formula of the cheek-teeth being $I.\ \frac{1}{1}$, $C.\ \frac{0}{1}$: it is represented in the Lower Miocene of Europe by *R. minutus*, and by another species in North America. At this stage of evolution the genus disappeared from the latter country.

The *Rhinocerotine* group is characterised by the presence of a single well-developed nasal horn,[1] and of cutting-teeth in both jaws. It is represented at the present day by the Asiatic *R. sondaicus* and *R. unicornis* (fig. 1243), the upper true molars of the former being of the type of those of *R. megarhinus* (fig. 1239), while those of the latter are of the more specialised type of *R. antiquitatis* (fig. 1245). The ancestor of *R. sondaicus* is probably to be found in *R. sivalensis*, of the Pliocene of India; while *R. palæindicus* appears to be the species from which *R. unicornis* has sprung. The *Ceratorhine* group, represented by the existing Asiatic *R. sumatrensis*, and the European Lower Pliocene *R. Schleiermacheri*, differs from the preceding by having two horns, placed one behind the other in the median line, but still retains cutting-teeth in both jaws; the upper

[1] The horn of the Rhinoceroses, it should be observed, consists merely of a bundle of closely agglomerated bristles, and has no bony attachment to the skull.

molars in both species being of the type of fig. 1239. This group cannot probably be separated from the next, with which it is connected by *R. persiæ*, of the Pliocene of Maragha in Persia, which had lower canines, although apparently allied to *R. platyrhinus*. The most specialised, or *Atelodine*, group is represented at the

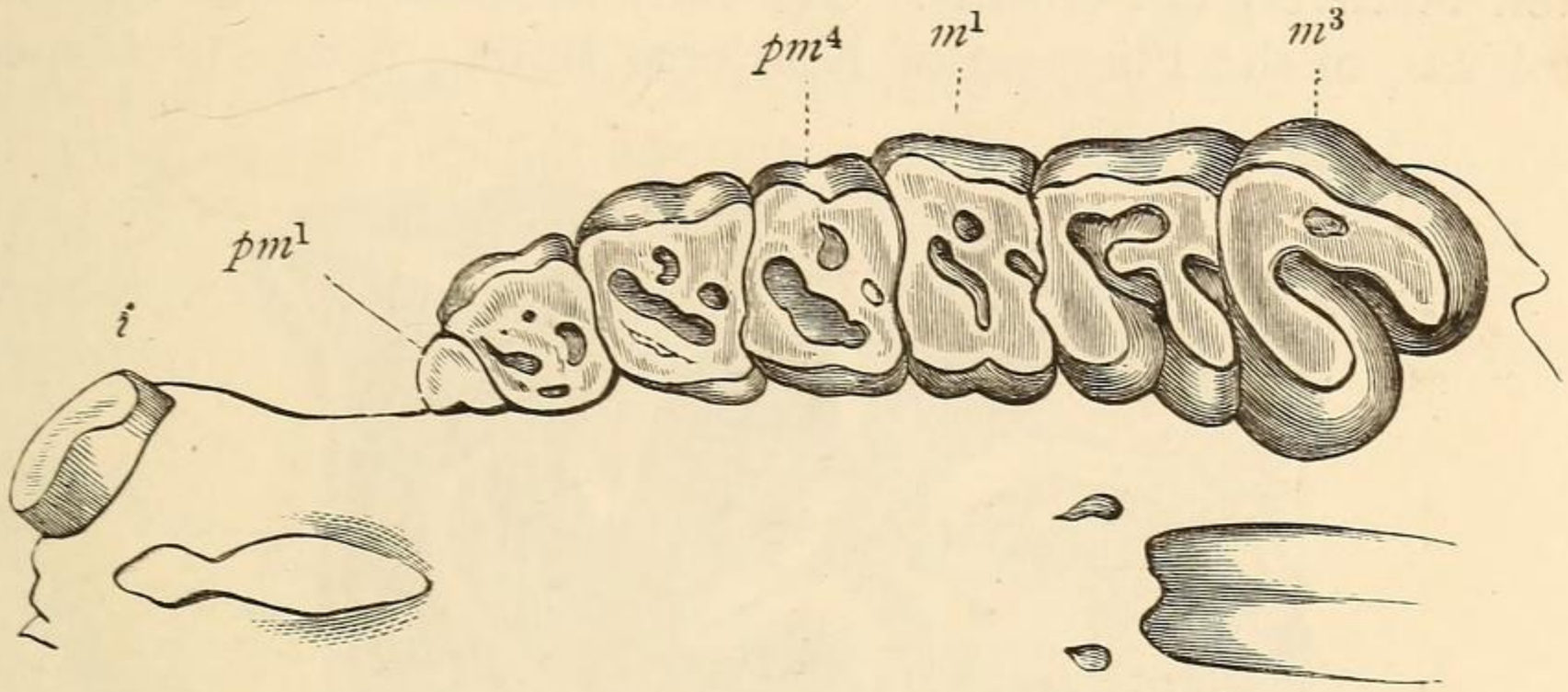

Fig. 1243.—Worn left upper dentition of *Rhinoceros unicornis;* India. Much reduced.
(After Cuvier.)

present day by the African *R. simus* and *R. bicornis*, in which there are two large horns, but no cutting-teeth in either jaw. Of species with upper molars of the simpler type of fig. 1239, we may mention *R. pachygnathus*, of the Lower Pliocene of Greece and the isle of Samos, which is closely allied to the African *R. bicornis; R. etruscus* (fig. 1244), of the Upper Pliocene of Europe (in which

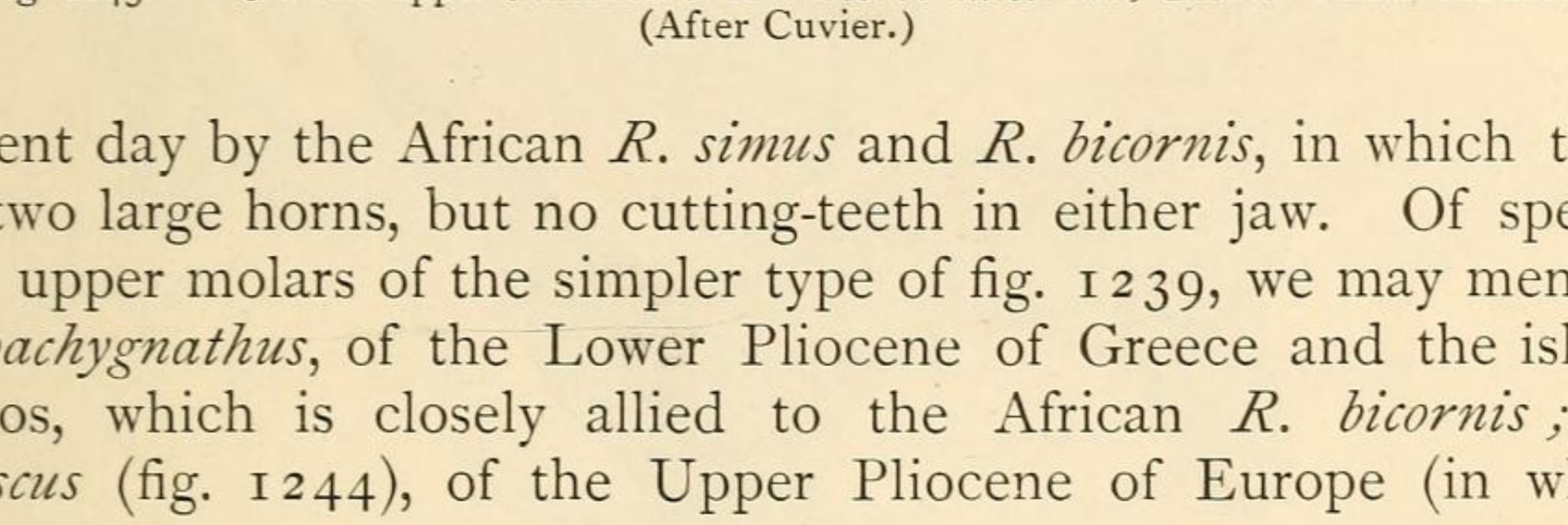

Fig. 1244 —Palatal view of the cranium of *Rhinoceros etruscus*, with the teeth much worn; Upper Pliocene, Italy. One-seventh natural size.

the molars are of a brachydont structure); *R. deccanensis* and *R. karnuliensis*, of the Pleistocene of Southern India; and *R. megarhinus* (fig. 1239) and *R. leptorhinus*, of the European Pleistocene. In the latter there is an ossification of the nasal septum. The other members of this group have their upper molars (fig. 1245) of

a more complex type; there being an absence of a buttress at the antero-external angle, and the folds of the crown so arranged that when more worn than in the figured specimen three islands of enamel would be formed on their crowns. These teeth are also characterised by their plane of wear being perfectly horizontal, and by their relatively tall crowns. An early member of this type is *R. platyrhinus*, of the Pliocene of Northern India; from which species

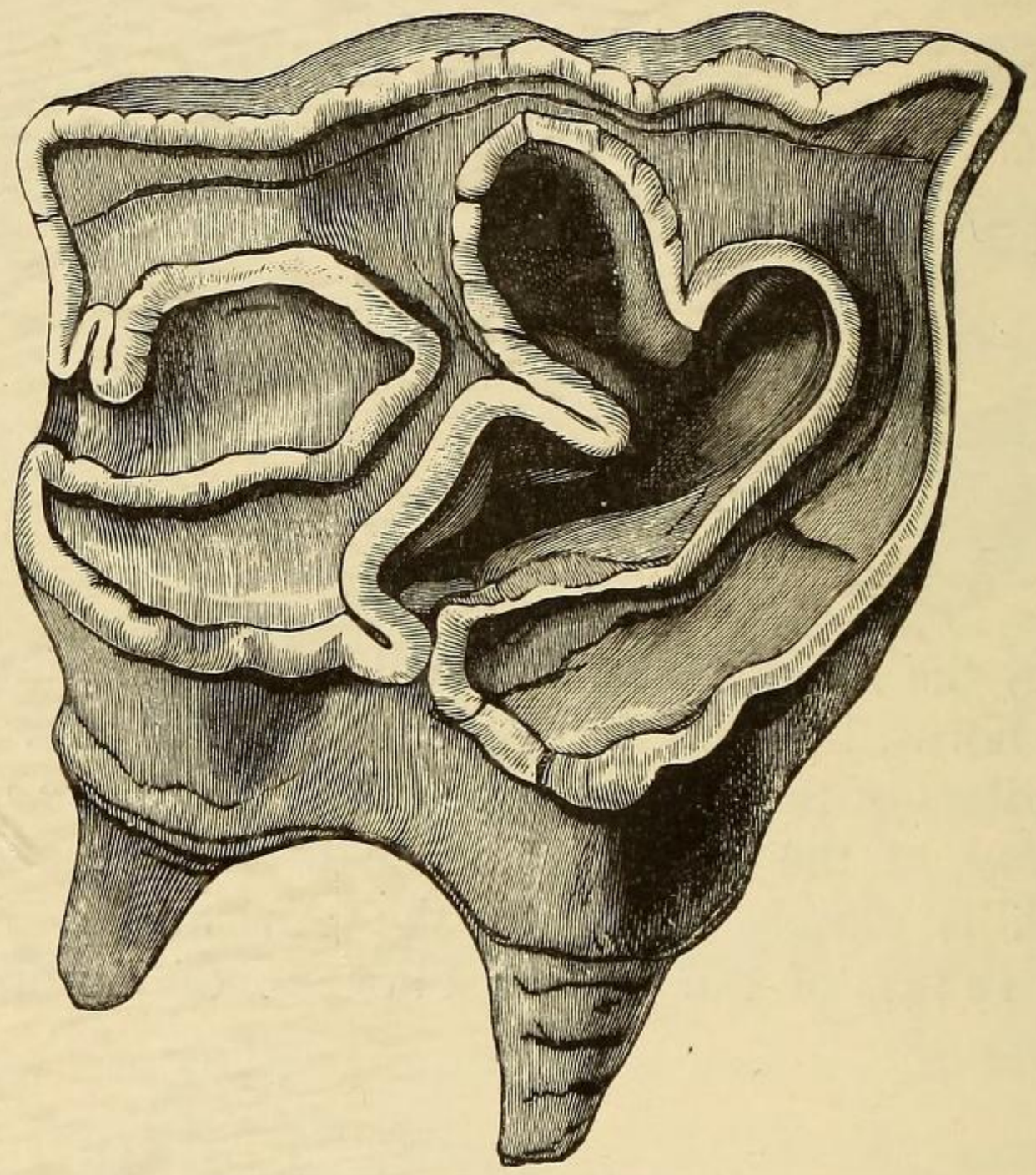

Fig. 1245.—The second right upper true molar of *Rhinoceros antiquitatis;* from the Pleistocene of Kent.

it is highly probable that both the existing African *R. simus*, and the Pleistocene *R. antiquitatis*, of Northern Asia and Europe, have been derived.

The latter species, of which the skull is represented in fig. 1246 and an upper molar in fig. 1245, is sometimes known as the Woolly Rhinoceros, since it was covered with a thick coat of woolly hair. The skin was devoid of the folds which characterise the large Indian species; and the front horn was of very large size. As in some of the Pleistocene species the septum of the nares was completely ossified (fig. 1246). This species is essentially a northern form, and has nearly the same distribution as the Mammoth, although it does not appear to have crossed Behring Strait into America. In time this Rhinoceros makes its first appearance in the Pleistocene Brick-earths of the Thames valley, and is very common in European cave-deposits, and in the *tundras* of Siberia. Complete carcasses, still covered with the dried flesh, skin, and hair, have not unfrequently been found washed out from the frozen alluvial deposits of these *tundras* on the banks of the Yenesi and Lena; from which we learn that

the food of this animal mainly consisted of the leaves and twigs of juniper and other coniferous plants.

The last representative of this family is the gigantic *Elasmotherium* (*Stereoceros*) of the Pleistocene of Siberia, in which the dental formula of the adult is $I.\ \frac{0}{0}$, $C.\ \frac{0}{0}$, $Pm.\ \frac{2}{2}$, $M.\ \frac{3}{3}$. The structure of the skull and limbs is essentially Rhinocerotic; and in the former the narial septum was completely ossified, and the frontals have a huge bony protuberance for the support of a large horn corresponding to the second one of *Rhinoceros antiquitatis*. The teeth differ considerably from those of any species of *Rhinoceros*,

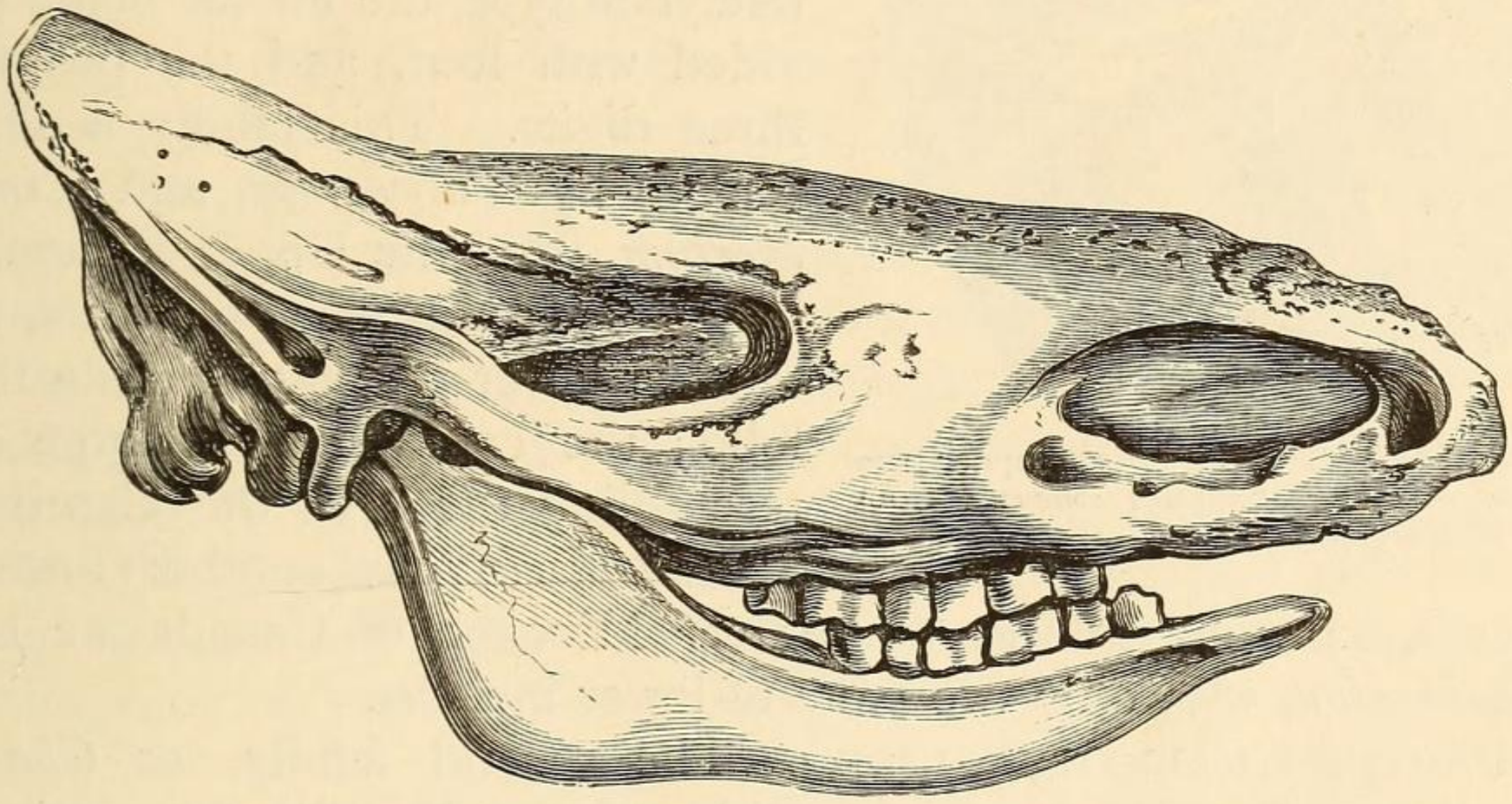

Fig. 1246.—Right lateral aspect of the skull of a young individual of *Rhinoceros antiquitatis*; from the Pleistocene of Siberia. Reduced.

and are characterised by their very tall crowns, plicated enamel, and smooth plane of wear. Their structure is, however, merely an extreme modification of the Rhinocerotic type, to which the nearest approach among later forms is made by *R. antiquitatis*. There is, however, in these teeth a marked resemblance to those of *Caduro-therium* and *Homalodontotherium*, and it is not improbable that *Elasmotherium* presents the last representative of a stock descended from the former genus which has remained altogether apart from the true Rhinoceroses.

Family Lambdotheriidæ.—With the *Lambdotheriidæ* we enter upon the consideration of the first of three extinct families in which the cheek-teeth have remarkably short (brachydont) crowns, and diverge to a certain extent from the more typical Lophodont form. The upper true molars (fig. 1247) may be described as consisting of four columns, of which the two hindmost are frequently connected by an oblique transverse ridge; while there may also be a more incomplete anterior ridge. When these teeth are worn two