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DESCRIPTIVE AND ILLUSTRATED
C A T A L O G U E
OF THE
FOSSIL ORGANIC REMAINS
OF
MAMMALIA AND AVES
CONTAINED IN
THE MUSEUM
OF
THE ROYAL COLLEGE OF SURGEONS
OF ENGLAND.



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IN the present Catalogue of the Fossil Remains of Mammals and Birds in the Museum of the College, the specimens have been severally referred to the species to which they belonged, the bones named according to the place in the skeleton, and the teeth according to the position in the dental series which they originally occupied. A brief exposition of the principal characters of the fossil, and of the differences which it presents in comparison with its nearest existing analogues, has been subjoined where required by the rarity or singularity of the specimen; and in the case of the remains of species imperfectly known or new to science, the descriptions are pursued to the details requisite to establish the characters and affinities of such species, and to serve for the identification of similar fossils which may hereafter be discovered. In some instances the determination of the precise affinities of the fossil has required microscopic investigation of the tissues, as in the teeth of the *Glyptodon*, *Mylodon* and *Megatherium*.

The matrix or geological formation, and the locality from which each specimen has been obtained, are subjoined to the determination or description, except in a few instances of the Hunterian specimens, where such records had not been preserved. A particular account has been added, from the best authorities, of the more remarkable localities, as the ossiferous caves of Gailenreuth, Kuloch, Oreston, &c.

The proportion of the original Hunterian specimens of Mammalian and Avian fossils to those subsequently added to the Collection of the College is so small, that the whole are incorporated in one system of arrangement and marked by consecutive or running numbers ; the original specimens, 330 in number, being specified as *Hunterian* ; the additions by the name of the *Donor* ; or, when obtained by purchase at the sale of a museum, by the name of its *Founder*.

With many fossils of extinct species the corresponding part of the nearest allied existing animal has been placed in juxtaposition, and such parts bear the same number as the fossils they illustrate, with an added dot, as No. 2, No. 2· ; No. 1579, 1579·.

Ten Plates are subjoined to the present Volume in illustration of some of the rarest fossil specimens, which have not before been figured in any Work.

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ERRATA.

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C A T A L O G U E.

FOSSIL ORGANIC REMAINS.

Class MAMMALIA.

Order CARNIVORA.

Tribe *Plantigrada*.

Family *Ursidæ*.

No.

1. The skull, wanting the lower jaw, of the great Cave Bear (*Ursus spelæus*, BLUMENBACH and CUVIER).

This is the original specimen described and figured by JOHN HUNTER, *Philosophical Transactions*, vol. lxxxiv. (1794), p. 416, pl. xix. fig. 1.*

From the great extent of the sagittal crest, and the sharpness of the

* Where not otherwise expressed, all the specimens of the Cave Bear (*Ursus spelæus*) form part of the original collection from the bone-caves of Gailenreuth, presented to John Hunter by the Margrave of Anspach, and noticed in the above cited paper in the *Philosophical Transactions*.

The following description, by the Margrave of Anspach, of the caves from which the fossils described in the text were taken, precedes the original memoir.

“ A ridge of primæval mountains runs almost through Germany, in a direction nearly from west to east; the Hartz, the mountains of Thuringia, the Fichtelberg in Franconia, are different parts of it, which in their further extent constitute the Riesenberg, and join the Carpathian mountains. The highest parts of this ridge are granite, and are flanked by alluvial and stratified mountains consisting chiefly of limestone, marl, and sandstone; such as least is the tract of hills in which the caves to be

lambdoidal crest, the large size of the frontal sinuses and protuberances, and the attrition of the molar teeth, this skull may be concluded to have belonged to an old male individual.

spoken of are situated; and over these hills the main road leads from Bayreuth to Erlang, or Nuremberg. Half-way to this town lies Streitburg, where there is a post, and but three or four English miles distant from thence are the caves mentioned, near Gailenreuth and Klausstein, two small villages, insignificant in themselves, but become famous for the discoveries made in their neighbourhood.

“ The tract of hills is there broken off by many small and narrow valleys, confined mostly by steep and high rocks, here and there overhanging, and threatening, as it were, to fall and crush all beneath; and everywhere thereabouts are to be met with objects which suggest the idea of their being evident vestiges of some general and mighty catastrophe which happened in the primæval times of the globe.

“ The strata of these hills consist chiefly of limestone of various colour and texture, or of marl and sandstones. The tract of limestone hills abounds with petrifications of various kinds.

“ The main entrance to the caves at Gailenreuth opens near the summit of a limestone hill towards the east. An arch, near seven feet high, leads into a kind of ante-chamber, eighty feet in length, and three hundred feet in circumference, which constitutes the vestibule of four other caves. This ante-chamber is lofty and airy, but has no light except what enters by its open arch; its bottom is level, and covered with black mould, although the common soil of the environs is loam and marl.

“ By several circumstances, it appears that it has been made use of in turbulent times as a place of refuge.

“ From this vestibule or first cave, a dark and narrow alley opens in the corner at the south end, and leads into the second cave, which is about sixty feet long, eighteen high, and forty broad. Its sides and roof are covered, in a wild and rough manner, with stalactites, columns of which are hanging from the roof, others rising from the bottom, meeting the first in many whimsical shapes.

“ The air of this cave, as well as of all the rest, is always cool, and has, even in the height of summer, been found below temperate. Caution is therefore necessary to its visitors; for it is remarkable that people, having spent any time in this or the other caverns, always on their coming out again appear pale, which in part may be owing to the coolness of the air, and in part likewise to the particular exhalations within the caves. A very narrow, winding and troublesome passage opens further into a

“ Third cave or chamber, of a roundish form, and about thirty feet diameter, covered all over with stalactites. Very near its entrance there is a perpendicular descent of about twenty feet, into a dark and frightful abyss; a ladder must be brought to descend into it, and caution is necessary in using it, on account of the rough and slippery stalactites. When you are down, you enter into a gloomy cave, of about fifteen feet diameter and thirty feet high, making properly but a segment of the third cave.

“ In the passage to this third cave, some teeth and fragments of bones are found; but coming down to the pit of the cave, you are every way surrounded by a vast heap of animal remains. The bottom of this cave is paved with a stalactical crust of near a foot in thickness; large and small fragments of all sorts of bones are scattered everywhere on the surface of the ground, or are easily drawn out of the mouldering rubbish. The very walls seem filled with various and innumerable teeth and broken

2. A similar but less mutilated skull, wanting the lower jaw, of the great Cave Bear: this is the original specimen described and figured by JOHN HUNTER, *loc. cit.*, pl. xix., fig. 2.

bones. The stalactical covering of the uneven sides of the cave does not reach quite down to its bottom, whereby it plainly appears that this vast collection of animal rubbish some time ago filled a higher space in the cave, before the bulk of it sunk by mouldering.

“This place is in appearance very like a large quarry of sandstones; and indeed the largest and finest blocks of osteolithical concretes might be hewn out in any number, if there was but room enough to come to them, and to carry them out. This bony rock has been dug into in different places, and everywhere undoubted proofs have been met with, that its bed, or this osteolithical stratum, extends every way far beneath and through the limestone rock into which and through which these caverns have been made; so that the queries suggesting themselves about the astonishing numbers of animals buried here confound all speculation.

“Along the sides of this third cavern there are some narrower openings, leading into different smaller chambers, of which it cannot be said how deep they go. In some of them bones of smaller animals have been found, such as jaw-bones, vertebræ, and tibiæ, in large heaps. The bottom of this cave slopes toward a passage seven feet high, and about as wide, being the entrance to a

“Fourth cave, twenty feet high and fifteen wide, lined all round with a stalactical crust, and gradually sloping to another steep descent, where the ladder is wanted a second time, and must be used with caution as before, in order to get into a cave forty feet high and about half as wide. In those deep and spacious hollows, worked out through the most solid mass of rock, you again perceive with astonishment immense numbers of bony fragments of all kinds and sizes, sticking everywhere in the sides of the cave, or lying on the bottom. This cave also is surrounded by several smaller ones; in one of them rises a stalactite of uncommon bigness, being four feet high and eight feet diameter, in the form of a truncated cone. In another of those side grottos, a very neat stalactical pillar presents itself, five feet in height, and eight inches in diameter.

“The bottom of all these grottos is covered with true animal mould, out of which may be dug fragments of bones.

“Besides the smaller hollows, spoken of before, round this fourth cave, a very narrow opening has been discovered in one of its corners. It is of very difficult access, as it can be entered only in a crawling posture. This dismal and dangerous passage leads into a fifth cave, of near thirty feet high, forty-three long, and of unequal breadth. To the depth of six feet this cave has been dug, and nothing has been found but fragments of bones and animal mould. The sides are finely decorated with stalactites of different forms and colours; but even this stalactical crust is filled with fragments of bones sticking in it, up to the very roof.

“From this remarkable cave another very low and narrow avenue leads into the last discovered, or the

“Sixth cave, not very large, and merely covered with a stalactical crust, in which, however, here and there bones are seen sticking. And here ends this connected series of most remarkable osteolithical caverns, as far as they have been hitherto explored; many more may for what we know exist, hidden, in the same tract of hills.”

2¹. A skull of the White or Polar Bear (*Ursus maritimus*, PALLAS). Hunter thus records his comparisons of the fossil with the recent Bear, the skull of which he has placed with them.

“The bones sent by His Highness the Margrave of Anspach agree with those described and delineated by Esper as belonging to the White Bear; how far they are of the same species among themselves I cannot say. The heads differ in shape from each other; they are upon the whole much longer for their breadth than in any carnivorous animal I know of; they also differ from the present White Bear, which, as far as I have seen, has a common proportional breadth. It is supposed, indeed, that the heads of the present White Bear differ from one another; but the truth of this assertion I have not seen heads enough of that animal to determine.

“The heads not only vary in shape but also in size; for some of them, when compared with the recent White Bear, would seem to have belonged to an animal twice its size, while some of the bones correspond with those of the White Bear, and others are even smaller.

“There are two ossa humeri rather of a less size than those of the recent White Bear; a first vertebra, rather smaller; the teeth also vary considerably in size, yet they are all those of the same tribe, so that the variety among themselves is not less than between them and the recent.

“In the formation of the head, age makes a considerable difference; the skull of a young dog is much more rounded than an old one; the ridge leading back to the occiput, terminating in the two lateral ones, hardly exists in a young dog; and among the present bones there is the back part of such a head, yet is larger than the head of the largest Mastiff; how far the young White Bear may vary from the old, similar to the young dog, I do not know, but it is very probable, *loc. cit.* p. 419.”

The skulls of the young and old White Bears in the Osteological Collection confirm Hunter's conjecture respecting the difference of form which is due to age in this species. It will be seen that Hunter adduces this conjectured change as one which must be taken into consideration in comparing recent and fossil crania of animals belonging to the same genus: but he does not assert that the differences which he had detected

between the fossil and recent skulls and between the different fossil skulls of the Cave Bears are of the same nature and degree.

The difference in the proportion of length to breadth which Hunter points out in the skull of the Cave Bear, as compared with that of the old White Bear, which he has placed in juxtaposition with the fossils, is one of the most striking discrepancies between the recent and fossil species; but it is not the only one. The last molar tooth of the upper jaw in the White Bear has a smaller antero-posterior diameter and a narrower posterior termination as compared with the penultimate molar, than in the Cave Bear. The interspace between the antepenultimate molar and the canine tooth presents the remains of two sockets, one near the molar, the other near the canine, which in younger but full-grown White Bears contain small and simple-fanged premolars. The youngest specimens of the Cave Bear in the present collection exhibit no trace of either of these small premolars, or of their sockets. The posterior palatal foramina are situated opposite the middle of the last molar in all the skulls of the White Bear, but opposite the interspace between the penultimate and last molars in the skulls of the Cave Bear. The zygomatic arches are wider and shorter in the White Bear; the base of the zygomatic process behind the glenoid cavity is more nearly horizontal in the White Bear.

The Grisly Bear agrees with the Cave Bear in the great proportional size of the last molar tooth, but the interspace between the antepenultimate grinder and the canine is relatively less than in either the Cave Bear or White Bear, and it contains two small and simple premolars in specimens, which from the worn state of the molar teeth have belonged to older individuals than those to which the skulls of the Cave Bear have belonged that present no trace of premolars.

3. A skull, wanting the lower jaw, of the Great Cave Bear (*Ursus spelæus*, fœni. ? *Ursus arctoïdeus*, BLUM. and CUVIER).

The state of the dentition proves this to have belonged to a young individual; the enamelled crowns of the canines are relatively smaller than in the specimens 1 and 2. The form and proportions of the entire skull, of the last molar, and of the edentulous diastema behind the canines, so

closely correspond with those in the skull of the *Ursus spelæus*, as to lead to the conclusion that the difference in the development of the frontal sinuses, the large size of which occasions the convexity of that region of the skull in the old male, is in the present instance attributable rather to age and sex than to specific distinction.

4. The posterior part of the cranium of the Cave Bear.

This is the original specimen described and figured by John Hunter, *loc. cit.*, pl. xx. fig. 1. The development of the sagittal crest has only just commenced at its junction with the lambdoidal crest: the upper surface of the skull covered by the parietal bones is smooth and convex: the sutures are not obliterated, and show that the sagittal crest commences at a sharp tooth-like process of the supra-occipital bone, passing forward like a wedge into the posterior interspace of the parietal bones; all these circumstances lead to the conclusion that the present specimen formed part of the skull of a young individual. As compared with the cranium of a young Grisly Bear (*Ursus ferox*), of the same size, the present fossil differs in the prominence of the side of the skull just below the squamous suture, and in the smaller breadth of the bony tentorium, especially at its middle part.

4¹. The skull of a nearly full-grown Grisly Bear (*Ursus ferox*, CLARKE).

The differences observable between this skull and that of the (presumed) young Cave Bear of the same age, are pointed out in the description of No. 4.

5. A mass of stalactite enveloping a portion of the cranial cavity and the crown of the canine tooth of the Cave Bear.

6. Portion of the skull including the left superior maxillary bone, with the three posterior molar teeth, of the Cave Bear (*Ursus spelæus*).

7. A portion of the left superior maxillary and palatine bones, including the three posterior molar teeth, of the *Ursus spelæus*. The tuberculate surface of the last grinder is nearly entire, showing the animal to have been young.

8. A portion of the left superior maxillary bone with the last molar and

socket of the other two molars of the *Ursus spelæus*; the grinding surface of the tooth is quite entire and unworn.

9. A portion of the right superior maxillary bone of the Cave Bear, containing the three posterior molar teeth; these, from the integrity of their grinding surface, have belonged to a young but nearly full-grown individual.
10. The intermaxillary and part of the maxillary bones, showing the sockets of the upper incisors and canines, together with the *foramina incisiva*, of the Cave Bear.
11. The right ramus and a portion of the left ramus of the lower jaw of the Cave Bear: it differs from that of the *Ursus ferox* in the greater breadth of the posterior molar as compared with its length, and in the greater convexity of the inferior contour of the ramus of the jaw, and in which circumstance likewise it differs, though in a somewhat less degree, from the Black Bear of Europe (*Ursus arctos*).
- 11'. The lower jaw of a nearly full-grown Grisly Bear.
12. The right ramus of the lower jaw of the *Ursus spelæus*, with the canine and molar teeth.
13. The left ramus of the lower jaw of the *Ursus spelæus*, with the canine and molar teeth. The crowns of the teeth show these specimens to have belonged to a young full-grown individual. Compared with the lower jaw of the Grisly Bear, they present the same difference in the relative breadth of the last molar tooth as in the specimen No. 11.
14. The left ramus of the lower jaw of the *Ursus spelæus* with the first, third and fourth molar teeth, the tuberculated surfaces of which are unworn.
15. The posterior part of the left ramus of the lower jaw of the *Ursus spelæus*; it shows the same character of the convex lower margin as the preceding specimen.
16. A fragment of the left ramus of the lower jaw of the *Ursus spelæus*, with the second molar tooth *in situ*, the tubercles of which are worn down. It also shows the socket of the first molar, and a portion of the socket of the third molar, and of that of the great canine.

This specimen is included in the original Hunterian Catalogue of Fossils (No. *r* 17), where it is ascribed to the 'White Bear,' and stated to be from "Bauman's Cavern in Germany."

In the greater relative breadth of the molar tooth, and in the edentulous condition of the interspace between the sockets of the canine and first true molar tooth, the present specimen agrees with the foregoing ones of the *Ursus spelæus* from the cavern at Gailenreuth, and differs, like them, from the *Ursus maritimus*. As it formed part of the collection of fossils made and catalogued by Hunter prior to the reception of the more numerous and complete specimens of the Cave Bear presented to him by the Margrave of Anspach, the distinctions which he subsequently recognized between the fossil and the recent Bear could scarcely have been appreciable.

The following is a description of Bauman's Cave.

"This celebrated and much frequented cave, or suite of caverns, has already been described by Leibnitz in his 'Protegeæ.' It derived its name from an unfortunate miner, who, in the year 1670, ventured alone to explore its recesses in search of ore; and after having wandered three days and nights in total solitude and darkness, at length found his way out in a state of such complete exhaustion, that he died almost immediately. It lies in a bed of transition limestone at the village of Rubeland, about two miles below the town of Elbingrode, on the north-east border of the Hartz, and in the country of Blankenburg."—"From the great cave we descend by a passage to a hollow vault: the lower half of which contains beneath a thick crust of stalagmite, an accumulation of several feet of mud or sand mixed with bones, and extremely large pebbles of transition limestone; the mud and pebbles have been separated from each other, and drifted to different parts of this vault. The bones which lie in the mud and sand are not much broken, and about thirty years ago some very entire ones were extracted from it, and sent to the Museum at Brunswick; but those which occur among the pebbles are more than usually fractured, and some of them stamped or pounded, as if in a mortar, into hundreds of small splinters, which adhere by stalagmite to the surface of some of the largest pebbles: none of them, however, have lost their angles, or are in any way rounded; but they are simply broken or crushed when in juxtaposition to the heavy pebbles, which are more abundant and longer here than in any other part of this, or indeed of any cavern I have yet visited."—"This cavern has, from its position in the inmost recesses, and its difficulty of access, been not much disturbed, and has several off-shoots, the contents of which are still glazed over with a crust of virgin stalagmite: in others the stalagmite has been broken through; and artificial vaults, like those at Schartzfeld, have been dug some feet into the subjacent mass of mud, which is also loaded with teeth, bones, and pebbles, but not with such large pebbles, or in such unusual quantity as in the vault E. The rock and sides of the artificial cave I, have bones adhering to them, or rather are in part composed of bones; but in none of the natural chambers do we find bones adhering to the side and roof above the surface of the mud and stalagmite."—*Buckland, Reliquiæ Diluvianæ*, p. 117.

17. A portion of the left ramus of the lower jaw, with part of the last molar tooth of the great Cave Bear, (*Ursus spelæus*).
18. The symphysial extremity of the left ramus of the lower jaw of the great Cave Bear, with the canine tooth and the socket of the first grinder, showing the characteristic diastema which separates them.
19. A fragment of the right ramus of the lower jaw of a fossil Bear, including the sockets of the canine and of the first molar. The interspace between these teeth is broken, but it is as long as in the *Ursus spelæus*.
20. The left external incisor of the upper jaw of the *Ursus spelæus*.
21. The left internal incisor of the upper jaw of the *Ursus spelæus*.
22. The corresponding tooth of a Bear of equal size.

From one of the limestone caves at Oreston. Discovered by Mr. Whidbey, in the year 1820.

Presented by Joseph Whidbey, Esq., Civil Engineer.

23. Two canines of the Cave Bear from the cave at Kuhloch, Saxony.

Presented by M. Augustus Vautier de Saltikoff.*

* The following graphic account of the cave of Kùhloch is from the pen of Dr. Buckland:—

“ It now remains only to speak of the cave of Kùhloch, which is more remarkable than all the rest, as being the only one I have ever seen, excepting that of Kirkdale, in which the animal remains have escaped disturbance by diluvial action; and the only one also in which I could find the black animal earth, said by other writers to occur so generally, and for which many of them appear to have mistaken the diluvial sediment in which the bones are so universally imbedded. The only thing at all like it that I could find in any of the other caverns, were fragments of highly decayed bone, which occurred in the loose part of the diluvial sediment in the caves of Schartzfeld and Gailenreuth; but in the cave of Kùhloch it is far otherwise. It is literally true that in this single cavern (the size and proportions of which are nearly equal to those of the interior of a large church) there are hundreds of cart-loads of black animal dust entirely covering the whole floor, to a depth which must average at least six feet, and which, if we multiply this depth by the length and breadth of the cavern, will be found to exceed 5000 cubic feet. The whole of this mass has been again and again dug over in search of teeth and bones, which it still contains abundantly, though in broken fragments. The state of these is very different from that of the bones we find in any of the other caverns, being of a black, or more properly speaking dark umber colour throughout, and many of them crumbling under the finger into a dark soft powder, resembling mummy powder, and being of the same nature with the black earth in which they are imbedded. The quantity of animal matter accumulated on this floor is the most surprising, and the only thing of the kind I ever witnessed; and many hundred, I may say thousand, in-

23¹. The canine of a large Polar Bear, to show its inferiority in size as compared with the extinct species.

24. The right superior canine of a fossil Bear, from Kent's Hole, Torquay.

Presented by Gerard Smith, Esq.

25. The fang of a canine of a fossil Bear, from the same cavern.

Presented by Gerard Smith, Esq.

dividuals must have contributed their remains to make up this appalling mass of the dust of death. It seems in great part to be derived from comminuted and pulverized bone; for the fleshy parts of animal bodies produce by their decomposition so small a quantity of permanent earthy residuum, that we must seek for the origin of this mass principally in decayed bones. The cave is so dry, that the black earth lies in a state of loose powder, and rises in dust under the feet: it also retains so large a proportion of its original animal matter, that it is occasionally used by the peasants as an enriching manure for the adjacent meadows. [I have stated that the total quantity of animal matter that lies within this cavern cannot be computed at less than 5000 cubic feet; now allowing two cubic feet of dust and bones for each individual animal, we shall have in this single vault the remains of at least 2500 bears, a number which may have been supplied in the space of 1000 years, by a mortality at the rate of two and a half per annum.] The exterior of this cavern presents a lofty arch E in a nearly perpendicular cliff, which forms the left flank of the gorge of the Esbach, opposite the castle of Rabenstein [see plate 18, E]. The depth of the valley below it is less than 30 feet, whilst above it the hill rises rapidly, and sometimes precipitously, to 150 or 200 feet. This narrow valley or gorge is simply a valley of denudation, by which the waters of the Esbach, D, fall into those of the Weissent. The breadth of the entrance-arch is about 30 feet, its height 20 feet. As we advance inwards the cave increases in height and breadth, and near its inner extremity divides into two large and lofty chambers, both of which terminate in a close round end, or *cul de sac*, at the distance of about 100 feet from the entrance. It is intersected by no fissures, and has no lateral communications connecting it with any other caverns, except one small hole close to its mouth, and which opens also to the valley. These circumstances are important, as they will assist to explain the peculiarly undisturbed state in which the interior of this cavern has remained, amid the diluvial changes that have affected so many others. The inclination of the floor, for about 30 feet nearest the mouth [see plate 18, E], is very considerable, and but little earth is lodged upon it; but further in the interior of the cavern G is entirely covered with a mass of dark brown or blackish earth, H, through which are disseminated in great abundance, the bones and teeth of bears and other animals, and a few small angular fragments of limestone, which have probably fallen from the roof, but I could find no rolled pebbles. The upper portion of this earth seems to be mixed up with a quantity of calcareous loam, which before it had been disturbed by digging, probably formed a bed of diluvial sediment over the animal remains; but, as we sink deeper, the earth gets blacker and more free from loam, and seems wholly composed of decayed animal matter. There is no appearance of either stalactite or stalagmite having ever existed within this cavern."—*Reliquiæ Diluvianæ*, p. 137.

26. The crown of a left canine tooth of the *Ursus spelæus*.
27. The left upper canine of a large species of Bear with the crown nearly worn away, evidently by use. From one of the limestone caverns at Oreston, discovered in the year 1820.
Presented by Joseph Whidbey, Esq., Civil Engineer.
28. The left lower canine of the same species of Bear, from the same locality.
Presented by Joseph Whidbey, Esq., Civil Engineer.
29. The penultimate molar of the left side of the lower jaw of the same species of Bear, from the same locality; it is shorter and broader than the corresponding tooth of the *Ursus spelæus*.
30. The penultimate molar of the right side of the upper jaw, of the same species of Bear, from the same locality: the crown is shorter and broader, and the fangs are smaller than in the *Ursus spelæus*; the tuberculated surface is much worn, indicating the tooth to have belonged to an aged individual. From the Oreston cavern, discovered in 1820.
Presented by Joseph Whidbey, Esq., Civil Engineer.
31. The penultimate molar, left side, upper jaw, of the *Ursus spelæus*.
32. The last molar, left side, upper jaw, of the *Ursus spelæus*.
33. The left posterior and superior molar tooth of the *Ursus spelæus*.
34. A similar specimen with the tuberculated surface, beautifully entire.
35. The right posterior molar, upper jaw, of the Cave Bear. This specimen was numbered 'r. 14' in the original Hunterian Catalogue of Fossils, in which it is stated to be from Bauman's cavern in the Hartz Forest, Germany.
36. The second molar tooth, right side, lower jaw, of the *Ursus spelæus*.
37. The anterior extremity of the left ramus of the lower jaw of the *Ursus priscus* (Goldfuss). The canine is in place, but the summit of the crown is broken off; immediately behind the canine is the socket of the first small spurious molar; the second molar is in place, in which the third or posterior inner tubercle and the posterior part of the grinding surface of the crown are both more elevated than in the corresponding unworn

tooth of the *Ursus spelæus*. The jaw of the *Ursus priscus* is relatively of less depth below the third and fourth grinders, in comparison with the size of those teeth, than in a Polar Bear of similar size; which, like the *Ursus priscus*, retains the small spurious molar immediately behind the canine. The third molar is one-half larger than in the Polar Bear, whilst the interspace between the first and second molars in the *Ursus priscus* is little more than half that in the *Ursus maritimus*. The anterior margin of the symphysis is more sloping in the *U. maritimus* than in the *Ursus priscus*.

This specimen, which is marked 'r. 18' in the original Hunterian Catalogue of Fossils, is stated to be from Germany.

38. A portion of the posterior part of the left ramus of the lower jaw of a Bear, containing the three posterior molar teeth; the last molar is relatively narrower than in the *Ursus spelæus*, and the longitudinal depression beneath the external alvcolar wall is more marked than in the *Ursus spelæus*. The worn surface of the teeth, the strong muscular impressions and the high coronoid process, indicate this fragment to have belonged to an old male specimen. It is more petrified than is usual in the cave fossils. This specimen is 'p. 11' in the Hunterian Catalogue of Fossils, but the locality from which it was obtained is not given.
39. The left upper canine of a small individual or species of Cave Bear; probably of the *Ursus priscus*.
40. The right inferior canine of a small individual or species of Cave Bear.
41. The canine of a Bear. From the limestone cavern at Oreston, discovered in 1820*. *Presented by Joseph Whidbey, Esq., Civil Engineer.*

* This and the preceding fossils of the Bear from Oreston are mentioned in the paper by Joseph Whidbey, Esq., Civil Engineer, in the Philosophical Transactions for 1821. They were found associated with the tooth of a Rhinoceros and some bones of a large Ruminant in a cavern in the limestone quarries, which is described as follows:—"These bones were lately found in a cavern one foot high, eighteen feet wide, and twenty feet long, lying on a thin bed of dry clay at the bottom; the cavern was entirely surrounded by compact limestone rock, about eight feet above high-water mark, fifty-five feet below the surface of the rock, one hundred and seventy-four yards from the original face of the quarries, and about one hundred and twenty yards, in that direction, from the spot where the former bones (those of a Rhinoceros) were found in 1816."

42. The atlas of the Cave Bear (*Ursus spelæus*).
- 42'. The atlas of the White Bear (*Ursus maritimus*). This differs from the preceding in the greater relative length and breadth, and squarer form of the transverse processes; in the greater vertical diameter of the cavities for the occipital condyles; and in the smaller size of the spinal canal. The odontoid surface is less distinctly marked off from the posterior articular surfaces than in the Cave Bear.
43. The vertebra dentata of the Cave Bear (*Ursus spelæus*).
- 43'. The corresponding bone of the White Bear. The superior vertebral laminae or neurapophyses in the Cave Bear have a less relative antero-posterior extent in proportion to their height; the inferior margin of the transverse process is concave in the Cave Bear, but is convex in the White Bear; the body of the vertebra projects further behind the base of the transverse process in the Cave than in the White Bear; the posterior oblique processes are turned more outwards in the Cave Bear; the odontoid process is more convex at its under part; the anterior part of the spinous process arches further forwards in the Cave Bear. In all the generic characters the dentatae of the recent and extinct species essentially resemble each other.
44. A lumbar vertebra of the Cave Bear.
45. A lumbar vertebra of the Cave Bear.
46. A posterior lumbar vertebra of an old Cave Bear, showing exostosis from the inferior surface of the body.
47. Some lumbar vertebræ and other bones of the Cave Bear, cemented together by a mass of stalactite.
48. The sacrum of a Cave Bear.
- 48'. The sacrum of a Grisly Bear.
49. The right humerus of the Cave Bear (*Ursus spelæus*).
50. The right humerus of the same species of Cave Bear.
51. The left humerus of apparently the same individual; this corresponds with

the lower figure of the humerus in Plate XX. of Hunter's Memoir, Phil. Trans., 1794.

51¹. The left humerus of a large and old specimen of the Polar Bear (*Ursus maritimus*). The upper figure of the humerus in the plate above quoted, closely corresponds with this specimen, and was probably engraved in order to illustrate the differences between the recent and fossil species. As the present bone was placed in the same drawer with the two preceding humeri of the Cave Bear, which it exceeds in size, it is most probable that they are the identical specimens alluded to in the following passage of Hunter's Memoir:—"There are two ossa humeri rather of less size than those of the recent White Bear." Hunter does not allude in the text to any other differences, but some of these are illustrated by the figures. These accurately show, for example, that the humerus of the White Bear is broader at both extremities, and thicker in proportion to its length than in the Cave Bear: the supinator ridge forms an angle instead of being continued downwards in a gentle convex curve; the internal condyle is much thicker and stronger where it bounds the olecranal cavity, and it extends inwards to a greater distance from the articular surface; the deltoidal ridge reaches lower down in the White Bear; the antero-posterior diameter of the proximal third part of the bone of the White Bear exceeds in a marked degree that of the extinct species.

The decease of Hunter took place before the observations on the fossil cave-bones, which he had communicated to the Royal Society, were read, and the individual to whom the task of superintending the printing of the paper was entrusted, ascribed, in the explanation of the Plates, both figures of the humeri to the fossil species. Cuvier, who did not perceive the resemblance of the upper figure to the humerus of the White Bear, and who therefore did not recognise the mistake, avails himself of that figure to illustrate his opinions respecting the specific distinction of his *Ursus spelæus* and *Ursus arctoides*.

There is preserved in the Parisian Collection a humerus of one of the great Cave Bears, the internal condyle of which is perforated, as in the

feline tribe ; whilst all the other humeri are imperforate and correspond with the lower figure in Hunter's plate. But the perforated fossil humerus figured by Cuvier differs from that of the White Bear figured by Hunter in the shorter deltoid ridge, the narrower proximal and distal extremities, the convex outline of the supinator ridge, and the inferior production of the inner condyle ; in short, in all those characters by which the imperforate fossil humerus has been shown above to differ from that of the White Bear. Not any of the three fossil humeri in the Hunterian Collection have the perforation of the internal condyle ; and amongst the extremely numerous humeri that have since been obtained from the bone-caves of Germany, not any have been found to present the perforation which Cuvier regards as the specific character of this bone in the *Ursus spelæus* ; it is most probable, therefore, as Professor De Blainville conjectures, that the perforation in question is an accidental anomaly.

51°. The left humerus of an immature Grisly Bear ; the relative breadth of the distal extremity arising principally from the great extension of the internal condyle surpasses that of the White Bear, and, *à fortiori*, differs from that of the *Ursus spelæus* ; this difference is the more satisfactory, as it is founded on the comparison of the bone of a young Grisly Bear with that of an old Cave Bear ; proving that the greater development of the internal condyle is not a character or consequence of age.

52. The right ulna of the Cave Bear (*Ursus spelæus*).

From the bone-cave of Gailenreuth.

Presented by the Earl of Enniskillen.

52¹. The right ulna of a Grisly Bear (*Ursus ferox*).

52². The right ulna of a Polar Bear (*Ursus maritimus*).

The ulna of the Cave Bear, compared with one of the Polar Bear of the same length, is less straight, being more convex towards the radius ; it is thicker, particularly at the anterior part of the shaft ; the ridge on the outside of the distal end of the bone is more produced ; the styloid process is more pointed ; and the concavity on the inner side of the proximal articular surface is deeper.

53. The proximal half of the left ulna of the great Cave Bear.

From one of the caverns in the limestone quarry at Oreston, near Plymouth.
Presented by Joseph Whidbey, Esq.

54. A corresponding part of a smaller individual or species of Bear.

From the bone-cave called Kent's Hole, near Torquay.

Presented by Gerard Smith, Esq.

55. The right radius of the great Cave Bear.

From the bone-cave at Muggendorf.

Presented by M. Augustus Vautier de Saltikoff.

56. The right pisiform bone of the *Ursus spelæus*.

57. The left pisiform bone of another individual.

58. The right femur of the great Cave Bear.

From the bone-cave at Muggendorf.

Presented by M. Augustus Vautier de Saltikoff.

59. The left femur of the *Ursus spelæus*.

- 59'. The corresponding femur of the White Bear.

The difference between these two bones is analogous to that which has been pointed out in the humeri of the recent and extinct species; the femur of the White Bear being broader in proportion to its length, especially at its two extremities. It is owing to this breadth that the small trochanter is thrown wholly to the posterior surface of the bone, the inner margin being continued beyond it; whilst in the Cave Bear, the small trochanter, though on the posterior surface of the bone, projects a little beyond the inner margin. At the distal end of the bone, the tuberosity above the internal condyle, corresponding with that in the humerus, is larger and more prominent in the White than in the Cave Bear; the same difference in the position in the small trochanter is presented by the Grisly Bear as compared with the Cave Bear, and the extremities of the bone are relatively broader.

60. The middle metatarsal bone of the right foot of the Cave Bear.

- 60'. The corresponding bone of a White Bear.

Genus *Gulo*.

61. A plaster cast of the posterior moiety of the left ramus of the lower jaw of the Cave Glutton (*Gulo spelæus*, GOLDFUSS). It contains the three posterior molar teeth.

Presented by Sir Philip de Malpas Grey Egerton, Bart., M.P.

62. A plaster cast of the shaft and distal extremity of the right humerus of the *Gulo spelæus*.

Presented by Sir Philip de Malpas Grey Egerton, Bart., M.P.

63. A plaster cast of the right tibia of the *Gulo spelæus*.

Presented by Sir Philip de Malpas Grey Egerton, Bart., M.P.

64. A plaster cast of the middle metacarpal bone of the *Gulo spelæus*.

The originals of the preceding casts were discovered in the bone-cave at Gailenreuth.

Presented by Sir Philip de Malpas Grey Egerton, Bart., M.P.

Tribe *Digitigrada*.Genus *Putorius*.

65. The cranium and right ramus of the lower jaw of a species of Stoat, very nearly allied to the Ferret (*Putorius Furo*, CUV.).

From one of the raised beaches near Plymouth.

Presented by Prof. Owen, F.R.S.

Genus *Canis*.

66. Right lower canine of a Wolf (*Canis lupus*, LINN.).

The fang of the tooth is absorbent and adheres to the tongue, from the loss of the animal matter; the colour of the enamel covering the crown has been changed to a jet black. This specimen is No. 'r. 50' in the original Catalogue of Fossils; but the locality and stratum are not recorded.

Hunterian.

67. The sectorial tooth of the right side, lower jaw, of a Wolf.

The locality is not recorded.

Hunterian.

The following fossils of the Wolf are from that division of the limestone quarries at Oreston, near Plymouth, called the 'Gallery,' and marked 'E' in the plate 6. of the Philosophical Transactions for the year 1823 ; in which volume this cavern and its fossils are described by Messrs. Whidbey and Clift.

68. The right side of the lower jaw, containing the five anterior molars of a Wolf (*Canis lupus*, LINN.).

69. The anterior portion of the right ramus of the lower jaw of an old Wolf, containing two incisors, the canine and four false molars, all much worn.

70. A portion of the left ramus of the lower jaw of a Wolf, containing five of the molar teeth, the crowns of which are not worn.

71. The anterior part of the left ramus of the lower jaw of a Wolf, containing the canine, the four anterior or spurious molars, and part of the first true molar, which from its peculiar form is called the carnassial or sectorial tooth.

72. The posterior part of the right ramus of the lower jaw of a Wolf, containing the last molar tooth ; the bone is enlarged and ulcerated near the angle, in which abscess on each side has produced sinuses perforating the angle. This specimen is figured in plate 8, figg. 2 and 3 of the Memoir above cited.

73. The posterior part of the left ramus of the lower jaw of a Wolf, similarly diseased, and perhaps belonging to the same individual.

74. One incisor tooth of a Wolf.

75. Four canine teeth of a Wolf.

76. Three canine teeth of the upper jaw of a Wolf.

77. Three more or less mutilated sectorial or first true molar teeth, of the left side, upper jaw, of a Wolf.

78. The second or penultimate true molar of the right side, upper jaw, of a Wolf.

79. The last true molar of the right side, upper jaw, of a Wolf.
80. Two false molar teeth of the left side, lower jaw, of a Wolf.
81. The sectorial tooth, of the left side, lower jaw, of a Wolf.
82. The sectorial tooth, of the right side, lower jaw, of a Wolf.
83. Three fractured cervical vertebræ of a Wolf.
84. A fractured dorsal vertebra of a Wolf.
85. A fractured lumbar vertebra of a Wolf.
86. The left humerus, wanting the proximal extremity, of a Wolf.
87. The shaft of the right humerus of a Wolf.
88. The proximal end of the right ulna of a Wolf.
89. The proximal part of the left ulna of a Wolf.
90. The proximal part of the right ulna of a Wolf; it has been gnawed by some small quadruped.

This specimen is alluded to in the following passage from the ‘*Reliquiæ Diluvianæ*’ of Dr. Buckland:—“The bones (at Oreston) appeared to us to have been washed down from above at the same time with the mud and fragments of limestone, through which they are dispersed, and to have been lodged wherever there was a ledge or cavity sufficiently capacious to receive them; they were entirely without order, and not in entire skeletons; occasionally fractured, but not rolled; apparently drifted, but to a short distance from the spot in which the animals died; they seem to agree in all their circumstances with the osseous breccia of Gibraltar, excepting the accident of their being less firmly cemented by stalagmitic infiltrations through their earthy matrix, and consequently being more decayed; they do not appear, like those of Kirkdale, to bear the marks of having been gnawed or fractured by the teeth of *Hyænas*, nor is there any reason to believe them to have been introduced by the agency of these animals. The only marks I have seen on them were those pointed out to me by Mr. Clift, of nibbling by the incisor and canine teeth of an animal of the size of a weasel, showing distinctly the different effect of each individual tooth on the ulna of a wolf and the tibia of a horse.” p.73.

91. The distal portion of the right radius of a Wolf.

92. The two outer metacarpal bones of the left foot of a Wolf.
 93. The left femur, wanting the distal end, of a Wolf.
 94. The distal part of the left tibia of a Wolf.
 95. Three metatarsal bones of the right foot of a Wolf.
 96. The proximal phalanx of the fourth toe of the right fore-foot of a Wolf.
 97. The proximal phalanx of the second toe of the left hind-foot of a Wolf.

All the preceding bones of the Wolf, from the limestone caverns at Oreston, near Plymouth, Devon, were discovered in 1822 by Mr. John Whidbey, Civil Engineer, and were presented by Mr. (now Sir John) Barrow, Secretary to the Admiralty.

98. Two canine teeth of a Fox (*Canis Vulpis*, LINN.).
 99. A cervical vertebra of a Fox
 100. A fractured dorsal vertebra of a Fox.
 101. The shaft of the humerus of a Fox.
 102. A portion of the shaft of the femur of a Fox.

The preceding specimens of the Fox are from the Oreston cavern, marked E in the figure above quoted. They were discovered by Mr. Whidbey, and presented by Sir J. Barrow, Secretary to the Admiralty.

Genus *Machairodus*.

103. The canine tooth of the *Machairodus latidens*, OWEN.

From the ossiferous cavern called Kent's Hole, Torquay, Devon.

Presented by the Earl of Enniskillen, D.C.L.

- 103¹. Two casts of canine teeth of the *Machairodus latidens*, from the same cavern.

Presented by the Rev. Dr. Buckland, F.R.S.

104. The cast of a canine tooth of the *Machairodus cultridens*, KAUP (*Felis cultridens*, BRAVARD, *Ursus cultridens*, CUVIER).

From the drift or diluvium of the Val d'Arno.

Presented by J. B. Pentland, Esq.

Genus *Hyæna*.

105. The upper portion of the cranium of the Cave Hyæna (*Hyæna spelæa*, Cuv.), with the right occipital condyle and right glenoid cavity: the cerebral cavity is exposed, on the inner surface of which the convolutions of the brain are strongly moulded: the bony tentorium is well shown, as also the great extent of the air sinuses which are continued beneath the sagittal crest as far as the occiput. The tympanic bulla is broken open, showing the inverted bony frame for the attachment of the membrane or ear-drum. From the length and elevation of the parietal crest and of those on the occipital surface of the skull, the specimen may be concluded to have belonged to an aged individual. It is larger, but not in a very great degree, than the skull of a full-grown Spotted or Cape Hyæna (*Hyæna crocuta*), from which it differs chiefly in the smaller interspace between the occipital condyle and the occipito-mastoid process, and in the greater relative extent of the posterior plate of the glenoid cavity.

This fossil is from the cavern in the limestone quarries of Oreston, near Plymouth, marked B in the plate 6. of the Memoir by Messrs. Whidbey and Clift above quoted. The fossil itself is figured in plate 11.

Presented by Sir John Barrow, F.R.S.

106. A portion of the cranium with both occipital condyles and the left glenoid cavity of a younger Cave Hyæna. The nonage of the individual to which this fossil belonged is shown by the small size of the sagittal and occipital crests, and the limited extent of the nasal sinuses, which are not continued backwards beyond the frontal bones.

From the cave B, at Oreston.

Presented by Sir John Barrow, F.R.S.

107. The posterior part of the left parietal bone of a young Cave Hyæna (*Hyæna spelæa*), from the bone-cave at Kirkdale, Yorkshire.

Presented by John Gibson, Esq., F.G.S.

108. A portion of the left superior maxillary bone of the Cave Hyæna, with the canine and molar teeth. The only difference which this specimen presents when compared with the Spotted Hyæna (*Hyæna crocuta*), is a

proportionately smaller size of the anterior and internal tubercle of the penultimate molar tooth and its closer approximation to the last molar, which is implanted by a single fang.

From the bone-cave called Kent's Hole, near Torquay.

Presented by Gerard Smith, Esq.

109. A considerable portion of the left ramus of the lower jaw of the Cave Hyæna, with the canine and molar teeth.

This fossil exceeds in size the corresponding portion of the jaw of the Spotted Hyæna, which is the largest known existing species: the posterior ridge of the second molar tooth is likewise broader, but no unequivocal specific differences can be distinguished.

This specimen is from the cave B, at Oreston: it is figured at plate 12. fig. 9, of the Memoir by Messrs. Whidbey and Clift above cited.

Presented by Sir John Barrow, F.R.S.

110. The anterior part of the right ramus of the lower jaw of the Cave Hyæna, having two of the incisors, the canine and three of the molar teeth.

From the cave B, at Oreston.

Presented by Sir John Barrow, F.R.S.

111. A considerable portion of the left ramus of the lower jaw of the Cave Hyæna, with one incisor and the four molar teeth. This specimen, which is from the bone-cave at Kirkdale, Yorkshire, so closely corresponds with the specimen from Oreston, Plymouth, as to leave no doubt of the specific identity of the ancient Hyænas of these distant parts of England.

Presented by John Gibson, Esq., F.G.S.

112. A portion of the left ramus of the lower jaw of a younger specimen of the Cave Hyæna, containing the sockets of the three incisors, the canine, and two molars. When compared with a specimen of corresponding age of the Spotted Hyæna, the fossil presents a larger relative size of the first molar, particularly of its posterior division, and also of the posterior ridge of the second molar. The distance between the canine and the first molar is greater in the recent than in the extinct species.

From the cave at Kirkdale, Yorkshire.

Presented by John Gibson, Esq., F.G.S.

113. A portion of the left ramus of the lower jaw, containing the last two grinders, of the Cave Hyæna.

From the cave at Kirkdale, Yorkshire.

Presented by John Gibson, Esq., F.G.S.

114. A portion of the right ramus of the lower jaw of the Cave Hyæna, containing two incisors, the canine and three of the molar teeth. In the greater relative size of the first molar and the shorter interspace separating it from the canine, this specimen offers the same differences from the Spotted Hyæna as do the preceding fossils.

From the cave at Kirkdale, Yorkshire.

Presented by John Gibson, Esq., F.G.S.

115. A cast of a considerable portion of the right ramus of the lower jaw of the Cave Hyæna, from the cavern at Gailenreuth. The specimen has contained the four molar teeth; it illustrates the specific identity of the continental with the British extinct Hyænas, and equally proves that both differ from the existing species in the characters already described.

Presented by Sir Philip de Malpas Grey Egerton, Bart., M.P.

116. A portion of the right ramus of the lower jaw of the Cave Hyæna. It contains the first and second molar teeth, which had been only recently acquired; they are larger than the corresponding teeth in specimen No. 111, from the cave at Kirkdale, but are supported by a smaller and shallower ramus; this specimen has, therefore, most probably belonged to a young male.

From Kent's Hole, near Torquay.

Presented by Gerard Smith, Esq.

117. A portion of the right ramus of the lower jaw of the Cave Hyæna, containing the two posterior molar teeth, much worn.

From Kent's Hole, near Torquay.

Presented by Gerard Smith, Esq.

118. A portion of the left ramus of the lower jaw of the Cave Hyæna, containing the first molar tooth.

From the cave B, at Oreston.

Presented by Sir John Barrow, F.R.S.

119. A portion of the left ramus of the lower jaw of a young Cave Hyæna, containing the sockets of the deciduous molars; the crowns of the permanent molars are still concealed.

From the cave at Kirkdale, Yorkshire.

Presented by John Gibson, Esq., F.G.S.

120. A portion of the left ramus of the lower jaw of a young Cave Hyæna; it contains the last deciduous molar, and the half-formed crowns of the penultimate, and last true molars which had not risen from the jaw; it may be observed that the deciduous molar has a more complicated crown than its successor, corresponding in form with the last true molar, and not with the penultimate one which is about to take its place.

This specimen is from the cave B, at Oreston, and is figured in Messrs. Whidbey and Clift's Memoir, pl. 10. fig. 7, *loc. cit.*

Presented by Sir John Barrow, F.R.S.

121. Two right incisors of the upper jaw of the Cave Hyæna.

From the cave at Kirkdale, Yorkshire.

Presented by John Gibson, Esq., F.G.S.

122. Two left incisors of the upper jaw of the Cave Hyæna.

From the cave at Kirkdale, Yorkshire.

Presented by John Gibson, Esq., F.G.S.

123. The symphysial end of the right ramus of the lower jaw of the Cave Hyæna, with the middle incisor.

From the cave at Kirkdale, Yorkshire.

Presented by John Gibson, Esq., F.G.S.

124. The two outer incisors of the upper jaw of the Cave Hyæna.

From Oreston.

Presented by Sir John Barrow, F.R.S.

125. The two outer incisors of the left ramus of the lower jaw of the Cave Hyæna.

From Oreston.

Presented by Sir John Barrow, F.R.S.

126. The two outer incisors of the left ramus of the lower jaw of the Cave Hyæna.
From Kirby Moorside.
Presented by John Gibson, Esq., F.G.S.
127. Two right upper canines of the Cave Hyæna, much worn.
From Oreston. *Presented by Sir John Barrow, F.R.S.*
128. The right upper canine tooth of the Cave Hyæna.
From Kent's Hole. *Presented by Gerard Smith, Esq.*
129. Two left upper canines of the Cave Hyæna.
From Kirby Moorside.
Presented by John Gibson, Esq., F.G.S.
130. One right canine of the lower jaw of the Cave Hyæna.
From Kirby Moorside.
Presented by John Gibson, Esq., F.G.S.
131. One left canine of the lower jaw of the Cave Hyæna.
From Kirby Moorside.
Presented by John Gibson, Esq., F.G.S.
132. Two corresponding teeth of the same species of Hyæna.
From Kent's Hole. *Presented by Gerard Smith, Esq.*
133. The right and left canine of the lower jaw of the Cave Hyæna.
From Oreston. *Presented by Sir John Barrow, F.R.S.*
134. The left canine of the lower jaw of an old Cave Hyæna, with an unusually long fang, much thickened by the growth of the outer layer of cementum. From Kirby Moorside.
Presented by John Gibson, Esq., F.G.S.
135. The right penultimate molar of the upper jaw of the Cave Hyæna.
From Kent's Hole. *Presented by Gerard Smith, Esq.*
136. The crown of the penultimate molar, left side, upper jaw, of the Cave Hyæna.
From Oreston. *Presented by Sir John Barrow, F.R.S.*

137. The penultimate molar, left side, upper jaw, of the Cave Hyæna.
From Kirby Moorside.

Presented by John Gibson, Esq., F.G.S.

138. A considerable portion of the opposite molar of the same species, from the same locality.

Presented by John Gibson, Esq., F.G.S.

139. The first molar tooth of the right ramus of a lower jaw of a Cave Hyæna.
From Kirby Moorside.

Presented by John Gibson, Esq., F.G.S.

140. A portion of the left ramus of the lower jaw, containing the first molar tooth of the Cave Hyæna.
From Kirby Moorside.

Presented by John Gibson, Esq., F.G.S.

141. The corresponding molar tooth of a larger and older individual of the same species, and from the same locality.

Presented by John Gibson, Esq., F.G.S.

142. The second molar tooth, right side, lower jaw, of a large Cave Hyæna; the upper half of the crown is worn away, and the fangs are solidified.
From Oreston.

Presented by Sir John Barrow, F.R.S.

143. The corresponding tooth of the opposite side of the lower jaw, similarly worn.

From Oreston.

Presented by Sir John Barrow, F.R.S.

144. A corresponding tooth of the same species of Hyæna, from the same locality.

In all these second molars the fangs are impressed with a longitudinal groove on their inner side.

Presented by Sir John Barrow, F.R.S.

145. The crown of the second molar tooth, right side, lower jaw, of a young Cave Hyæna; the formation of the fangs has only commenced.
From Oreston.

Presented by Sir John Barrow, F.R.S.

146. The crowns of two of the second molar teeth, right side, lower jaw, of the Cave Hyæna.

From Kirby Moorside.

Presented by John Gibson, Esq., F.G.S.

147. The crown of the second molar tooth, left side, lower jaw, of a young Cave Hyæna; only the outer shell has been completed.

From Kirby Moorside.

Presented by John Gibson, Esq., F.G.S.

148. A fully formed corresponding molar tooth of an older individual of the Cave Hyæna.

From Kirby Moorside.

Presented by John Gibson, Esq., F.G.S.

149. The third molar tooth, right side, lower jaw, of the Cave Hyæna.

From Kirby Moorside.

Presented by John Gibson, Esq., F.G.S.

150. The crown of the third molar tooth, left side, lower jaw, of a young Cave Hyæna; only the outer shell of the tooth has been completed.

From Kirby Moorside.

151. A fully formed corresponding molar tooth of an older individual of the Cave Hyæna.

From Kirby Moorside.

Presented by John Gibson, Esq., F.G.S.

152. The third molar tooth, left side, lower jaw, of the Cave Hyæna; it corresponds in character and was contained in the same box with the sectorial molar of the Wolf (No. 81.), but the locality is not noticed.

Hunterian.

153. The last molar tooth, right side, lower jaw, of an old Cave Hyæna; the crown is worn and the fangs are consolidated.

From Kirby Moorside.

Presented by John Gibson, Esq., F.G.S.

154. The crown of the last molar tooth, left side, lower jaw, of a young Cave

Hyæna: it is hollow, and the cutting edge retains the original crenations.

From Kirby Moorside.

Presented by John Gibson, Esq., F.G.S.

155. Two corresponding molar teeth, fully formed, from individuals of different ages of the Cave Hyæna.

From Kirby Moorside.

Presented by John Gibson, Esq., F.G.S.

156. The fifth cervical vertebra of the Cave Hyæna.

From one of the caves at Oreston.

Presented by Sir John Barrow, F.R.S.

157. The anterior and posterior oblique processes of the left side of a cervical vertebra of the Cave Hyæna.

From Kirby Moorside.

Presented by John Gibson, Esq., F.G.S.

158. The first lumbar vertebra of the Cave Hyæna.

From Kirby Moorside.

Presented by John Gibson, Esq., F.G.S.

159. A corresponding vertebra of a young Cave Hyæna.

From Kirby Moorside.

Presented by John Gibson, Esq., F.G.S.

160. The distal half of the right humerus of the Cave Hyæna.

From Oreston.

Presented by Sir John Barrow, F.R.S.

161. The outer metacarpal bone of the right foot of the Cave Hyæna; and a corresponding bone of the left foot of probably the same individual.

From Oreston.

Presented by Sir John Barrow, F.R.S.

162. The distal half of the right tibia of a Cave Hyæna.

From Oreston.

Presented by Sir John Barrow, F.R.S.

163. The left astragalus of a Cave Hyæna.

From Kirby Moorside.

Presented by John Gibson, Esq., F.G.S.

164. A portion of a proximal phalanx of the right hind-foot of the Cave Hyæna.
From Oreston. *Presented by Sir John Barrow, F.R.S.*
165. The second phalanx of the inner toe of the left hind-foot of the Cave Hyæna.
From Oreston. *Presented by Sir John Barrow, F.R.S.*
166. The metatarsal and three phalangeal bones of the Cave Hyæna.
From Kirby Moorside.
Presented by John Gibson, Esq., F.G.S.

Genus *Felis*.

167. The left superior canine tooth of the *Felis spelæa*, Cuv.
From the cave called Kent's Hole, near Torquay, Devon.
Presented by Gerard Smith, Esq.

The following plaster-casts of the large extinct Lion or Tiger, called *Felis spelæa*, were discovered in the bone-cave at Gaylenreuth, and presented to the Museum by Sir Philip de M. Grey Egerton, Bart., M.P.

168. The left superior canine tooth of the *Felis spelæa*.
169. The two external incisors, upper jaw, of the *Felis spelæa*, Cuv.
170. The posterior molar of the right side of the upper jaw of the *Felis spelæa*.
171. The anterior part of the right ramus of the lower jaw of the *Felis spelæa*.
- 171'. The right ramus of the lower jaw of the Tiger (*Felis Tigris*); besides the difference in size, which is greatly in favour of the extinct species of *Felis*, the canine tooth is placed more vertically in the jaw in the Tiger.
172. The atlas, wanting the left transverse process, of the *Felis spelæa*.
- 172'. The atlas of the Tiger.
173. The third cervical vertebra of the *Felis spelæa*.

173¹. The third cervical vertebra of the Tiger.

The spinous process is more developed, and the under part of the body is more convex in the extinct than in the recent species.

174. The thirteenth dorsal vertebra of the *Felis spelæa*.

174¹. The corresponding vertebra of the Tiger.

The body of the vertebra is deeper in proportion to its length, and is more convex below than in the Tiger, in which the under surface is marked with a slight longitudinal ridge as in the cervical vertebræ. The articular cavities for the last pair of ribs are deeper in the *Felis spelæa*, and indent the contour of the anterior part of the body of the vertebræ on each side.

175. A mutilated lumbar vertebra of the *Felis spelæa*.

175¹. A corresponding lumbar vertebra of the Tiger.

The under surface of the vertebra is longitudinally ridged at its anterior part in both the recent and the extinct species.

176. A mutilated lumbar vertebra of the *Felis spelæa*.

176¹. A corresponding lumbar vertebra of the Tiger.

177. An anterior caudal vertebra of the *Felis spelæa*.

177¹. A corresponding vertebra of the Tiger.

178. A mutilated anterior caudal vertebra of the *Felis spelæa*.

179. A middle caudal vertebra of the *Felis spelæa*.

179¹. A corresponding caudal vertebra of the Tiger.

180. A posterior caudal vertebra of the *Felis spelæa*.

180¹. A corresponding vertebra of the Tiger.

181. A posterior caudal vertebra of the *Felis spelæa*.

182. A caudal vertebra of the *Felis spelæa*, from very near the end of the tail.

183. The left humerus, wanting the distal end, of the *Felis spelæa*.

183¹. The left humerus of the Tiger.

The humerus of the extinct species is more flattened along its poste-

rior part, and is relatively broader antero-posteriorly ; the deltoid ridge being more produced, and giving a more angular outline to the anterior contour of the bone. The commencement of the characteristic perforation of the internal condyle may be seen in the fossil.

184. The right scapho-lunar bone of the *Felis spelæa*.

184'. A corresponding bone in the Tiger ; very little difference save that of size can be detected in the fossil.

185. The metacarpal bone of the second or index digit of the left anterior extremity of the *Felis spelæa*.

185'. The corresponding metacarpal of the Tiger.

The superior size of this and the following bones of the paw of the fossil *Felis* is worthy of notice.

186. The metacarpal bone of the third or medium digit of the left anterior extremity of the *Felis spelæa*.

186'. The corresponding bone of the Tiger.

187. The metacarpal bone of the fourth digit of the left anterior extremity of the *Felis spelæa*, wanting the distal end.

187'. The corresponding bone of the Tiger.

188. The metacarpal bone of the fifth digit of the left anterior extremity of the *Felis spelæa*.

188'. A corresponding bone of the Tiger.

189. The proximal phalanx of the fifth digit of the left anterior extremity of the *Felis spelæa*.

189'. A corresponding bone of the Tiger.

190. A portion of the left os innominatum, with the cotyloid cavity of the *Felis spelæa*.

191. The right femur of the *Felis spelæa*.

191'. The right femur of the Tiger.

Besides the difference of size, the shaft of the femur is more cylindrical

and less compressed from before backwards in the extinct than in the recent species.

192. The right tibia, with the proximal extremity mutilated, of the *Felis spelæa*.

192'. The right tibia of the Tiger.

Besides the difference in size the shaft of the tibia is less compressed from before backwards, along its distal third, in the extinct than in the recent species.

193. The left astragalus of the *Felis spelæa*.

193'. The left astragalus of the Tiger.

The lower part of the articular surface for the fibula is more produced outwards in the extinct *Felis*; with this exception there is no other difference except in size.

194. The right astragalus of the *Felis spelæa*.

194'. The right astragalus of the Tiger.

195. The right calcaneum of the *Felis spelæa*.

196. The right calcaneum of the Tiger.

197. The right external cuneiform bone of the *Felis spelæa*.

197'. The right external cuneiform bone of the Tiger.

198. The second right metatarsal bone of the *Felis spelæa*.

198'. The corresponding bone of the Tiger.

199. The third right metatarsal bone of the *Felis spelæa*.

200. The corresponding bone of a species of *Felis*, as large as the Tiger.

From the bone-cave at Kirby Moorside.

Presented by John Gibson, Esq., F.G.S.

200'. The corresponding bone of the Tiger.

201. The fourth right metatarsal bone of the *Felis spelæa*.

201'. The corresponding bone of the Tiger.

202. The proximal phalanx of the fifth or outer toe of the right hind-foot of the *Felis spelæa*.
- 202¹. The corresponding bone of the Tiger.
203. The middle phalanx of the fifth or outer toe of the right hind-foot of the *Felis spelæa*.
- 203¹. The corresponding bone of the Tiger.
204. The second left metatarsal bone of the *Felis spelæa*.
- 204¹. The corresponding bone of the Tiger.
205. The third left metatarsal bone of the *Felis spelæa*.
- 205¹. The corresponding bone of the Tiger.
206. The fourth left metatarsal bone of the *Felis spelæa*.
- 206¹. The corresponding bone of the Tiger.
207. The fifth left metatarsal bone of the *Felis spelæa*.
- 207¹. The corresponding bone of the Tiger.
208. The proximal phalanx of the fourth toe of the left hind-foot of the *Felis spelæa*.
- 208¹. The corresponding bone of the Tiger.
209. The distal or unguis phalanx of the fourth toe of the left hind-foot of the *Felis spelæa*.
- 209¹. The corresponding bone of the Tiger.

The superior size of the paws of the extinct Lion or Tiger, as compared with those of the largest Bengal Tiger in the Hunterian Collection, is illustrated by the recent bones in juxtaposition with the fossils, and may be appreciated by those who may not have the opportunity of comparing them, by the following table of admeasurements:—

		<i>Felis spelæa</i> .		<i>Felis Tigris</i> .	
		in.	lines.	in.	lines.
Length of the first left metacarpal bone		4	6	3	9
Ditto first left metatarsal bone		5	3	4	3
Ditto second left metatarsal bone		5	9	4	6
Ditto third left metatarsal bone		6	0	4	7
Ditto fourth left metatarsal bone		5	6	4	1
Ditto proximal phalanx of second toe, left hind-foot		2	5	1	10

210. The skull, wanting the lower jaw of the extinct crested Tiger (*Felis cristata*, Falconer and Cautley). This completely petrified skull was discovered by the collectors employed by Walter Ewer, Esq., of the E. I. Civil Service, at the foot of a sandstone cliff, partly encased in a hard stone matrix, in the tertiary strata of the Sivalik Hills. The sockets of the teeth, some of which contain the fangs, prove that the animal had acquired its full size, and the condition of the sagittal and deltoidal crests indicate that it had arrived at full maturity, if not old age; yet it is of a smaller size than the common Tiger, as the following dimensions show:—

	<i>Felis cristata.</i> in. lines.	<i>Felis Tigris.</i> in. lines.
1. Extreme length from the occipital crest to the alveolar margin of the intermaxillaries	10 10	14 1
2. Extreme breadth across the zygomatic arches	8 0	9 6
3. From the postorbital process to occipital crest	6 0	7 6
4. From ditto to alveolar margin of intermaxillaries	4 10	6 7

The cranium of the *Felis cristata* differs from that of the Tiger, as exemplified by the third and fourth admeasurements, in the relative shortness of the facial, compared with the cranial part of the skull; in which respect it likewise differs, though in a minor degree, as has been pointed out by Messrs. Falconer and Cautley, from the Leopard, the Cheetah, the Puma and the Jaguar. In the truncated extremity of the nasal process of the superior maxillary bone, and the greater backward extension of the nasal bones, the *Felis cristata* most resembles the Tiger. In size, however, it most nearly approaches the Jaguar, but differs from that and the skulls of other existing felines, in the parallelism of the posterior superior contour of the skull with the basal line, and in the greater height of the occipital region, on which the above parallelism depends. It is characterized likewise by the saliency of the sagittal crest, from which the specific name of the fossil is derived; and likewise by the elevated position and the strongly arched outline of the inferior margin of the zygomatic arches.

Presented by Walter Ewer, Esq., F.R.S.

Order RODENTIA.

Genus *Castor*.

211. The anterior part of the skull, wanting the nasal bones, of a Beaver (*Castor europæus*, OW., *Castor fossilis*, GOLDF.). The incisors are broken: three anterior molars remain in place on the right side: the first is the deciduous molar, and is retained in the socket by three diverging fangs, in the interspace of which the crown of the permanent successor is exposed on the left side. The specimen has therefore belonged to an immature animal. It was discovered in a moss-pit in Berkshire. *Hunterian.*

211¹. The cranium of an American Beaver (*Castor Canadensis*, KUHLE), with the nasal bones removed, for comparison with the fossil. *College.*

A transverse line has been drawn across the anterior orbital processes of the frontal bone, in the recent and fossil specimens, to illustrate the osteological difference pointed out by Cuvier (*Ossemens Fossiles*, 4to, 1823, p. 57) between the Beaver of Europe and that of America; viz. that the nasal bones extend beyond that line further in the European than in the Canadian species: the present fossil agrees with the European Beaver in this character; but the species has long been extinct in Great Britain.

212. The right ramus of the lower jaw of a fossil Beaver (*Castor europæus*).
From a moss-pit in Berkshire. *Hunterian.*

Genus *Trogotherium*.

213. The right incisor of the lower jaw of the gigantic fossil Beaver (*Trogotherium Cuvieri*, FISCHER). This specimen is No. r. 21. of the Hunterian Catalogue, and is described as "a long cutter of the scalpris-dentata, or Glires genus". The locality is not indicated, but fossils of the same genus occur in the Norfolk Crag. *Hunterian.*

213'. The corresponding tooth of the *Castor Canadensis*. *College*.

Besides the striking difference of size, the fossil is distinguished by the transverse convexity of the outer enamelled surface of the tooth, which describes half a circle, and by the concavity of the inner or median facet, which is flat in the Canada Beaver.

Genus *Ctenomys*.

214. A small fragment of the superior maxillary bone, with portions of the four sockets, and the first and second molar teeth of the *Ctenomys antiquus*. The molars are somewhat larger, the longitudinal groove on their external surface is somewhat deeper, and the last molar is relatively wider than in the *Ctenomys Brasiliensis*.

215. A portion of the left ramus of the lower jaw, with the incisor and first molar tooth, of the *Ctenomys antiquus*.

216. The left lower incisor tooth of the *Ctenomys antiquus*.

The preceding fossils were discovered in a reddish earthy stratum at Monte Hermoso, Bahia Blanca, Patagonia, and were presented to the Royal College of Surgeons by Charles Darwin, Esq., F.R.S. They are described and figured in the Zoology of the Voyage of the Beagle, Fossil Mammalia, p. 109, pl. xxii. figs. 6—11.

Genus *Incognitum*.

217. A considerable portion of the skeleton of the right hind-foot of a small Rodent quadruped. It includes the astragalus, calcaneum, cuboides, external cuneiforme, middle cuneiforme, and the metatarsals and proximal phalanges corresponding with those of the three middle toes of five-toed quadrupeds: a rudiment of one inner toe is indicated by an articular facet on the tibial side of the expanded base of the second metatarsal.

This fossil was discovered at Monte Hermoso, in the same stratum as the preceding fossils, and was presented to the College by Charles Darwin, Esq., F.R.S. It is described and figured in the work above-cited, p. 110, pl. xxii. fig. 12.

Order EDENTATA.

Tribe *Phyllophaga*.

Family *Gravigrada*.

Genus *Megatherium*.

218. The anterior or facial part of the skull of the *Megatherium Cuvieri*, including the anterior terminations of the temporal ridges, the anterior part of the orbits, the sockets of the two anterior teeth and a considerable portion of the intermaxillary bones. The convergence of the temporal ridges as they ascend from the post-orbital tuberosities shows that the extent of origin of the temporal muscles is relatively greater than in the *Mylodon*, or other known *Megatherioid* quadrupeds; these ridges are, in fact, represented as meeting on the upper surface of the skull in the Madrid specimen. The larger proportional length of the teeth, which causes a greater depth of both upper and lower jaws in the *Megatherium* than in its congeners, makes the lower jaw relatively heavier, and thus necessitates the superior size of the temporal muscles. There is no trace of a distinct lachrymal bone. The malar process of the superior maxillary bone is short, but deep, and presents a rough and irregularly indented surface, for the articulation of the malar bone, which the Madrid specimen shows to be large and complicated. The malar process of the maxillary is perforated by three ant-orbital foramina, bearing about the same proportional size to the skull, as does the corresponding single foramen in the *Tapir*. The fronto-maxillary suture may be traced from below the post-orbital tuberosity, crossing obliquely the upper end of the malo-maxillary articulation, and extending forwards to the middle of the lateral margin of the nasal cavity, of which the frontal bone contributes a portion, for the extent of nearly two inches, and thus separates the maxillary from the nasal bones. The transverse suture between the nasal and frontal bones may be traced, though partly obliterated, five inches anterior to the orbits. The nasal bones, which have been con-

fluent with each other, and with the remarkably thick and strong anterior part of the vomer, are suddenly enlarged at their lateral margins, which project in the form of rough oblong tuberosities into the nasal cavity. The vomer expands superiorly into a horizontal plate, which supports the thinner part of the nasal bones, and bends down at its outer margin, to form the origin of the superior and anterior turbinated bones. A longitudinal ridge extends along the inner or nasal surface of the superior maxillary, to give attachment to the inferior turbinated bone; the anterior socket is in the form of a half-cylinder, with its convex side forwards; the second socket is an equilateral four-sided cavity; the interspace between the anterior sockets is one inch and a half, and the narrow intermolar part of the palate contracts as it extends backwards. The intermaxillary bones have no ascending portion. They present a subcompressed quadrilateral form; their posterior extremities are wedged into rough depressions of the maxillaries: they soon meet each other and circumscribe the small anterior palatal foramina, which have a single inferior outlet, and are firmly connected together by the whole of their median margins: their anterior extremities, which are represented as being expanded in the Madrid specimen, are broken off in the present one.

This specimen was found in the bed of the River Salado, one of the tributaries of the Rio Plata, situated to the south of the city of Buenos Ayres.

Presented by Sir Woodbine Parish, K.H., &c. &c.

219. A portion of the middle part of the skull of the Megatherium, with a vertical section removed from the series of teeth on the right side: these are five in number, the last being the smallest, and with the convexity of one of its curves turned backwards in a direction opposite to that of the first molar. Besides their true number the teeth are shown by this section to be implanted by an undivided base, of nearly similar size and form to the exposed crown, but excavated by a large conical pulp-cavity, the apex of which extends to within an inch of the grinding surface of the tooth. On the left side may be seen the malo-maxillary suture, with part of the malar bone attached; also the fronto-maxillary suture, and

the depression at the anterior end of the maxillary bone for the reception of the intermaxillary. The upper part of this instructive fragment is broken away and water-worn, exposing the pulp-cavities of the four anterior teeth of the left side: the contour and relative size of the crowns of the entire series of teeth on this side are demonstrated by a transverse section.

220. The longitudinal vertical section of the right molar series, removed from the preceding specimen: it shows also the great vertical extent and even surface of the superior maxillary bone behind the orbit.

The portion of skull which has afforded the two preceding preparations was discovered at Punta Alta, Bahia Blanca, Patagonia, and was presented to the College by Charles Darwin, Esq., F.R.S.

221. The posterior part of the skull of the Megatherium: the occipital condyles project outwards and backwards from the foramen magnum, and form the posterior termination of the skull; the occipital region slopes upwards and forwards from the foramen, and is excavated by two deep depressions, separated from each other by a strong median crest, and separated by a thicker arched ridge from the upper boundary of the occipital region, which has here been broken away; external to these cavities there is a narrower depression, probably for the origin of the digastric muscle: the anterior condyloid foramen is absolutely smaller than in the Mylodon, indicating a much smaller relative development of the tongue: the mastoid part of the temporal is excavated beneath by a moderately large and smooth elliptical cavity, for the reception of the head of the styloid or stylo-hyoid bone: the basilar portion of the sphenoid, which intervenes between these cavities, is dilated by air-cells: the carotid canal runs on each side between these bullæ osseæ and the petrous bone, and curves inwards, indenting the upper part of the body of the sphenoid, which forms the broad and shallow sella turcica. The posterior part of the cranial cavity is broader than it is high, and is small in proportion to the size of the animal. The vertical diameter of the cranial cavity is four inches, eight lines; its transverse diameter, which is

greatest at the part corresponding with the posterior part of the cerebral hemispheres, is six inches: from these indications it may be concluded that the brain of the Megatherium was flatter or more depressed, and smaller by nearly one-half than that of the Elephant; but that the cerebellum was relatively larger and situated more posteriorly with relation to the cerebral hemispheres.

From Punta Alta, Bahia Blanca, Patagonia.

Presented by Charles Darwin, Esq., F.R.S.

The following specimens of the teeth of the Megatherium will be described in detail, as no complete account of the dentition of this remarkable extinct animal has hitherto been published; and such a description may be most essential to the determination of the species—if there be more than one—of the genus.

222. The first right molar tooth of the upper jaw. This is the second in point of size, the last being the least. It is eight inches and a half in length; the pulp-cavity extends five inches from the base: it presents two slight curvatures, one having the convexity turned forward, and the other inward. The transverse section gives an irregular semicircle, with the convexity turned forward, and the flat side next the second tooth: the angles at which this joins the curve are rounded; the outer angle is somewhat produced, and the outer side of the curve is flattened. The grinding surface presents two transverse ridges, one close to the anterior surface, the back part of which is nearly vertical; the other near the posterior margin with a nearly vertical posterior slope, and a longer and more oblique anterior one. The central axis of the tooth, formed by the vascular dentine, is irregularly tetragonal: the cement is thick on the anterior and posterior surfaces, thin on the sides of the tooth.

From the Rio Salado, Buenos Ayres.

Presented by Sir W. Parish, K.H.

223. The second right molar of the upper jaw. This is the largest of the upper teeth, and is upwards of nine inches in length, of a tetragonal form, with two slight curvatures, as in the preceding tooth. The posterior

and broadest side is nearly flat, the anterior side somewhat convex, the outer and narrowest side is concave, the inner side is sinuous, having a median longitudinal eminence between two longitudinal concavities. The central axis of vascular dentine is more compressed from before backwards than in the preceding tooth, and its posterior surface is concave: the two transverse ridges of the grinding surface of the tooth are nearly equal, but the sloping side formed by the dentine is larger than that formed by the cement.

From the Rio Salado, Buenos Ayres.

Presented by Sir W. Parish, K.H.

224. A portion of the corresponding molar tooth of a larger Megatherium.

From the province of Buenos Ayres.

Purchased.

225. The second left molar of the upper jaw.

From the Rio Salado.

Presented by Sir W. Parish, K.H.

226. The third left molar of the upper jaw. It nearly resembles in form the second, but the anterior and outer angle is less rounded off, and the external longitudinal depression rather more marked.

From the Rio Salado.

Presented by Sir W. Parish, K.H.

227. Portions of the second and third left molars of the upper jaw, with portions of the sockets.

From Punta Alta, Bahía Blanca, Patagonia.

Presented by Charles Darwin, Esq., F.R.S.

228. This tooth so closely agrees with the first molar of the upper jaw, that if it be not the corresponding tooth of another species of Megatherium, it must be referred to the corresponding place in the lower jaw. The anterior surface is less convex than in the upper molar, and the entire tooth presents a tetragonal, rather than a semi-cylindrical form; the anterior facet being, however, half the breadth of the posterior one, by which it differs from all the tetragonal teeth of the upper jaw. Both the inner and outer sides which converge to the anterior surface are slightly concave, whilst the inner side, on the first upper molar, is convex. The

present molar has the same double curvature, and the same transverse diameter as its presumed opponent, but, owing to the flattening of its fore-part, it has not the same antero-posterior diameter.

From the province of Buenos Ayres.

Purchased.

229. A molar tooth of a tetragonal form, but with the anterior facet relatively broader and flatter than in the preceding, but narrower than in any of the tetragonal teeth of the upper jaw. It may be the second molar of the lower jaw.

From the Rio Salado.

Presented by Sir W. Parish, K.H.

230. The third (?) molar of the lower jaw. This tetragonal tooth differs from those of the upper jaw, but most resembles the third in its slight and single curvature. The anterior and posterior sides are convex, the outer and inner ones are concave.

From the Rio Salado.

Presented by Sir W. Parish, K.H.

231. The fourth (?) molar of the lower jaw. It has a slight double curvature, and is tetragonal, like the preceding tooth, but the outer and inner sides are somewhat less concave.

From the Rio Salado.

Presented by Sir W. Parish, K.H.

232. A portion of the jaw of a Megatherium, containing the last molar tooth. This is at least two-thirds smaller than the tooth which precedes it, and thus corresponds with the last or fifth small molar of the upper jaw, which is displayed *in situ* in Nos. 219 and 220. It differs from that molar in being straighter, and in the smaller antero-posterior diameter compared with the transverse diameter. The posterior surface is flatter, and the angles dividing the four surfaces are more marked. Should this be the last molar of the lower jaw, it will be the fifth molar, and the additional number of the lower molar teeth will thus compensate for the small size and simple form of the last molar in the Megatherium, as compared with the other known Megatherioid genera.

From the Rio Salado.

Presented by Sir W. Parish, K.H.

233. A corresponding molar tooth of a *Megatherium*.

From Punta Alta, Bahia Blanca, Patagonia.

Presented by Charles Darwin, Esq., F.R.S.

The following specimens of the osseous remains of the *Megatherium* are parts of one and the same skeleton, which was discovered in the bed of the Rio Salado, with No. 218.

Presented by Sir W. Parish, K.H.

The casts of these bones which are preserved in the Museum, bear the same numbers as the original specimens, and are distinguished by the letter c.

234. The atlas of the *Megatherium*.

235. The spinous process and left posterior articular process of the axis or vertebra dentata of the *Megatherium*. The spine is much extended from before backwards, and is moderately high, with a rough expanded posterior margin and a broad obtuse bifurcate posterior extremity, which slopes backwards so as to have overhung the third vertebra.

236. The anterior end of the body with the odontoid process of the same vertebra; the lower part of the process presents an elliptical and slightly convex surface, adapted to the articulation upon the body of the atlas.

237. The body, transverse and inferior articular processes, of the third cervical vertebra.

238. The neural arch and spine of the third cervical vertebra.

239. The body and spine of the fourth cervical vertebra.

240. The fifth cervical vertebra. The spinous process is small, compressed, sub-triangular and vertical in position; three transverse processes are developed from each side of the body; the inferior one, which is extended longitudinally beyond both the anterior and posterior surfaces of the body, is flattened, the second is short and thick, and is developed from the side of the vertebral foramen, the third is also a short and thick process extending from the side of the anterior articular process.

241. The neural arch and spinous process of the first dorsal vertebra: it is the highest and broadest spine in the whole vertebral region.

242. A scored fragment of the body of a dorsal vertebra*.
243. The neural arch and spine of the fourth dorsal vertebra.
244. The neural arch and spine of the fifth dorsal vertebra.
245. The neural arch and spine of the sixth dorsal vertebra ; the third median articular process is first developed between the two ordinary articular or oblique processes in this vertebra.
246. The seventh dorsal vertebra.
247. The eighth dorsal vertebra.
248. The ninth dorsal vertebra.
249. The tenth dorsal vertebra.
250. The neural arch and spine of the eleventh dorsal vertebra.
251. The twelfth dorsal vertebra.
252. The thirteenth dorsal vertebra. In this and the preceding vertebræ there may be observed, besides the characteristic median articular surface between the oblique processes, three distinct articulations for the ribs on each side of the vertebra : one on the posterior superior angle of the body, the second on the neural arch, and a third on the extremity of the short and thick transverse process.
253. The neural arch and spine of a posterior dorsal vertebra.
254. The neural arch and spine of the fifteenth dorsal vertebra ; the posterior articular processes, in this vertebra, are double, and are divided by a wide and deep notch.
255. The neural arch and spine of the sixteenth dorsal vertebra. The ante-

* The Peons, or labouring Spanish colonists, who first discovered the above-described fossil bones of the Megatherium, made use of the bodies of the vertebræ, in the absence of stones in the flat alluvial plains intersected by the Rio Plata and its tributaries, to support their camp-kettles : and only the neural arches and spinous processes of many of these vertebræ could be collected, when, by the intervention of Sir Woodbine Parish, the remains of this Megatherium were secured for the Royal College of Surgeons.

rior articular processes, in this vertebra, send upwards a ridge from along nearly the middle surface, towards the anterior part of the transverse process.

The dorsal vertebræ of the *Megatherium* very closely resemble those of the *Mylodon*, subsequently to be described; but the spines of the anterior ones are relatively longer, in relation to the relatively larger and heavier head. They are equally remarkable, with those of the *Mylodon*, for the capacity of the spinal canal, the expanded arches of which similarly overlap each other, and are articulated by broad, flat, and nearly horizontal surfaces: the only difference deserving notice in the dorsal vertebræ of the *Megatherium* is this, that through a great proportion of the posterior part of the dorsal region there is a third articular surface on both the front and back parts of the imbricated neural arches: the anterior surface is situated on the anterior part of the base of the spine, between the two normal articular processes; the posterior median surface is supported on an osseous platform, depending from the posterior and under part of the root of the spine.

256. The body of the last lumbar vertebra: it is characterized by the flatness of its posterior surface.

257. The pelvis of the *Megatherium*.

This is the most striking feature in the skeleton of the present gigantic extinct Sloth: it consists of five sacral vertebræ, anchylosed to each other and to both the iliac and ischial bones. The latter are united to the extremities of the transverse processes of the last two sacral vertebræ, which are unusually thick and strong; the great ischiadic notch is thus converted into a foramen, as in the pelvis of the existing Edentate quadrupeds. Among these the Sloths alone resemble the *Megatherium* in the expansion of the iliac bones, but this character is more marked in the *Megatherium* than in the Elephant, and is associated with a much greater proportionate size of the pelvis: the extreme breadth of the pelvis in the large Asiatic Elephant is three feet, eight inches, whilst in the *Megatherium* it is upwards of five feet. The spines of the four anterior sacral vertebræ are confluent at their base; their summits, which are re-

presented as distinct in the figures of the Madrid Megatherium, are here broken off; the spine of the fifth sacral vertebra is distinct from its origin. The pelvis, which Cuvier was led to suspect, from the defective condition of that part of the Madrid skeleton, to be naturally open anteriorly as in the small Ant-eater, is here shown to be inclosed by a narrow symphysis pubis. The acetabula are large, excavated by an oblong depression for the synovial adipose tissue, and looking downwards and a little outwards. The size and strength of the ordinary processes of the pelvis, the great breadth of the rough labrum of the iliac bones, and the numerous and well-defined inter-muscular crests indicate the unusual size and vigour of the muscular masses which proceeded from the pelvis in different directions to act upon the trunk and anterior extremities, and upon the hind limbs and tail. They lead to the conviction that the resistance which demanded such forces for its overcoming must have been of a very different nature and degree to any that now opposes itself to the labours of the existing vegetable feeders in supplying their daily wants; whence it may be inferred that the exertion of such forces was associated with equally peculiar habits in the Megatherioid animals*.

258. The body and left transverse process of the first caudal vertebra.
259. The neural arch and spine of the same vertebra.
260. The hæmapophyses of the same vertebra. Their proximal extremities are expanded, and each supports two oval and nearly flat articular surfaces, separated by a rough tract, an inch and a half in diameter; they gradually taper towards their inferior extremities, which terminate obtusely and are not united together, as in the succeeding caudal vertebræ, where they constitute by that union, the hæmal arch or chevron-bone.
261. A scorched and mutilated body of the second caudal vertebra.
262. The neural arch, wanting the spine, of probably the same caudal vertebra.

* This argument is pursued to its legitimate consequences in the *Memoir on the Mylodon*, 4to, 1842, pp. 138–162.

263. The body and left transverse process of the third caudal vertebra.
264. The body and both transverse processes of the fourth caudal vertebra.
265. The conjoined hæmapophyses of the same vertebra. The posterior articular surface is developed upon the base of the left hæmapophysis, but is represented by a rough tuberosity on that of the right one.
266. The body of the fifth caudal vertebra.
267. The hæmapophyses of the same vertebra.
268. The body and neural arch of the sixth caudal vertebra. The two articular surfaces for the hæmapophyses are present at the posterior part of the under surface of the body of the vertebra: the anterior surfaces are represented by two rough tubercles.
269. The hæmapophyses of the same vertebra.
270. The body and neural arch of the seventh caudal vertebra: the anterior hæmal surfaces are represented by rough tubercles.
271. The hæmapophyses of the same vertebra.
272. The body and neural arch of the eighth caudal vertebra.
273. The hæmapophyses of the same vertebra.
274. The body and neural arch of the ninth caudal vertebra.
275. The hæmapophyses of the same vertebra.
276. The body and neural arch of the tenth caudal vertebra.
277. A caudal vertebra from towards the posterior part of the tail; the neural spine is almost obsolete; the articular surfaces of the anterior oblique processes are rough, showing that the synovial capsules have been exchanged for ligamentous joints: only the left posterior hæmal tubercle supports a smooth articular surface: the neural arch is still entire and perforated for the passage of the cauda equina.
278. A caudal vertebra from near the end of the tail, apparently the fifteenth;

it is perforated by the spinal canal, but both the oblique and spinous processes of the neural arch are obsolete ; four rough tubercles at the under part of the body indicate the attachment of the hæmapophysys.

279. The hæmal arch and spine of a more posterior caudal vertebra ; the posterior articular surfaces are not developed on the base of either hæmapophysys, but are represented by rough tubercles.
280. The body and neural arch of apparently the seventeenth caudal vertebra.
281. A caudal vertebra from near the termination of the tail, apparently the eighteenth : the spinal canal is a narrow open fissure ; the hæmapophysial tubercles are very feebly developed at the anterior part of the body of the vertebræ, and are lost posteriorly.
282. The first rib of the right side. The vertebral portion is ankylosed to the sternal portion, which is ossified : the vertebral end presents a single oblong articular surface extending from the upper part of the head along the short neck to the tubercle : the sternal end has a single subtriangular articular surface for junction with the manubrium sterni.
283. The corresponding rib of the left side.
284. The second rib of the left side. The vertebral portion is ankylosed to the ossified sternal portion ; the surface on the upper part of the head and tubercle is divided into two by a rough tract above the neck, besides which there is an articular surface at the extremity of the head which is, as it were, truncated to form it. The articular extremity of the sternal piece presents two distinct surfaces, separated by an intermediate rough groove.
285. Part of the vertebral portion with the ankylosed sternal portion of the second rib of the right side.
286. The third rib of the right side. The vertebral portion is ankylosed to the ossified sternal portion : the vertebral end presents the terminal flat surface upon the head, a convex surface above the head, and another

upon the tubercle : the sternal end has also the two distinct convex surfaces, the posterior of which is constricted in the middle, as if preparatory to its division.

287. The corresponding rib of the left side.
288. The vertebral portion of apparently the fourth rib of the left side.
289. The vertebral portion of apparently the fifth rib of the left side.
290. The vertebral portion of apparently the sixth rib of the left side.
291. The vertebral portion of apparently the seventh rib of the left side.
292. The vertebral extremity, including the neck and tubercle of apparently the seventh rib of the right side.
293. The head and neck of apparently the eighth rib of the left side.
294. A fragment of apparently the corresponding rib of the right side.
295. The vertebral portion of apparently the ninth rib of the right side.
296. The vertebral portion of the corresponding rib of the left side.
297. The vertebral portion of apparently the tenth rib of the right side.
298. The head, the tubercle, and the shaft, in three separate pieces, of the corresponding rib of the left side.
299. The vertebral portion of the eleventh rib of the right side.
300. The portion of the corresponding vertebral rib of the left side.
301. The vertebral portion of the twelfth rib of the right side. In this the articular surface has disappeared from the tubercle, but the two articular surfaces of the head and neck remain distinct.
302. The tubercle and shaft of the corresponding rib of the left side, in two separate pieces.
303. The shaft of the vertebral portion of apparently the thirteenth rib of the right side.

304. The head, neck and shaft of the corresponding rib of the left side, in which the two articular surfaces, which are distinct in the twelfth rib, have become confluent.
305. The vertebral portion of the fourteenth rib of the right side : it has only one articular surface at the proximal end.
306. The proximal, or vertebral end of the corresponding rib of the left side.
307. The vertebral portion of the fifteenth rib of the right side.
308. The vertebral extremity of the corresponding rib of the left side.
309. A fragment of apparently the sixteenth and last rib.
310. A corresponding fragment of the opposite side.
311. The ossified sternal portion of an anterior rib of the right side : the sternal extremity is divided by a deep rough notch, on each side of which is a convex articular surface : the lower one is constricted in the middle and divided into two.
312. The ossified sternal portion of a more posterior rib of the right side : the lower articular surface of the sternal end is continuous with the inner portion of the upper articular surface, the outer portion of which is distinct.
313. The ossified cartilage of a rib of the left side, the sternal extremity of which presents three articular surfaces. Both in this and the preceding bone there is an articular surface near the costal extremity, which joins a contiguous sternal rib.
314. The manubrium sterni. The triangular articular surface on each side is for the first rib ; the inferior convexity is for the succeeding bone of the sternum ; and the rough depressions above the costal articulations are for the attachment of the clavicular ligaments.
315. One of the bones composing the body of the sternum. It is remarkable for the number of its articular surfaces, which are not fewer than ten : one of these is situated on the anterior, another on the posterior part of

the bone, for the junction with the antecedent and following bones of the sternum ; the remaining eight articulations are more concave, and are situated in pairs, two on the upper and two on the lower surface of each side ; they receive portions of the bifid extremity of the ossified sternal ribs, which are articulated to the interspace of the sternal bones. A similarly complex articulation of the ribs with the sternum exists in the Great Ant-eater (*Myrmecophaga jubata*).

316. A sternal bone, apparently the last of the series, since it has only the surface on the anterior part for the antecedent bone, and none on the posterior part : the inferior lateral costal articular surfaces are confluent, or single, on each side, and almost meet upon the posterior surface of the bone ; they appear to have received the ossified cartilages of the last pair of true ribs, which must have differed from the rest by terminating in a simple expanded, instead of bifurcate, extremity.
317. The right clavicle. It presents a strong sigmoid curvature ; is expanded at both extremities, that next the sternum being the largest ; and the intermediate, sub-cylindrical shaft is traversed below by a broad rough oblique ridge.
318. The right scapula. In this bone may be noticed the supra-spinal foramen and the osseous arch connecting the acromion with the coracoid ; by both of which characters Cuvier first detected the affinities of the Megatherium to the Sloths (*Bradypus*).
319. A portion of the left scapula, including the acromion and glenoid cavity.
320. The left radius. The concave proximal articular surface is nearly circular ; the rough tuberosity for the insertion of the tendon of the biceps is well developed : the outer margin becomes thinner, and gradually subsides as it extends downwards : in the figure of the same bone in the skeleton of the Megatherium at Madrid this ridge stands out like a well-defined process. The posterior surface of the present radius presents a moderate and equable convexity ; there is a rough convex protuberance above the styloid process ; the shaft of the bone gradually expands to near the

distal end. Those features of the radius of the *Megatherium* are here noticed by which it chiefly differs from the corresponding bone of the *Mylodon*.

321. The right scapho-trapezial bone.

This bone is marked *r* in figure 13, pl. 217. of the *Ossements Fossiles*, ed. 8vo. 1836, and is called by Cuvier the ‘os cuneiforme :’ it is indubitably the analogue of the carpal bone which in the Sloths and *Mylodon* consists of the confluent scaphoides and trapezium. The trapezial portion is relatively smaller than in the *Mylodon*, and the articular surface for the metacarpal bone of the pollex is still less. The dorsal surface of the bone is excavated by an angular notch for the reception of the trapezoides : there is a distinct articular surface on the concave distal side of the bone for the os magnum.

322. The right os lunare.

323. The right os cuneiforme. The articular surface for the ulna is of an oval shape, convex at the anterior and concave at the posterior part : it is separated by a moderately wide tract from the radial surface of the os lunare. The rough dorsal surface of the cuneiforme supports a well-marked protuberance.

324. The right trapezoides. The proximal surface is convex transversely, concave from behind forwards, and joins a corresponding concavo-convex surface in the scaphoides : the distal surface is principally convex : both surfaces are joined by a small articular facet on the radial side of the bone, which is adapted to a corresponding surface in the small metacarpal bone of the thumb ; and by a more extended articular facet on the ulnar side for junction with the os magnum.

325. The right os magnum. This bone is here, as in the carpus of many quadrupeds, remarkable for its small size.

326. The right os unciforme. It presents the figure of a transversely elongated hexahedron, the outer side formed by a rough projection separating the cuneiform surface from that which supports the fifth metacarpal. The

- three distal surfaces for the three outer metacarpals are nearly in the same transverse line, which runs parallel with that applied to the os cuneiforme. The dorsal surface is traversed at its outer half by a transverse ridge, terminating in a projection between two deep grooves.
327. The metacarpal bone of the first digit or thumb of the same right fore-foot. It has no distal articular surface for a phalanx, and is the only representative of the rudimental pollex. There are two surfaces at the proximal end, one of which is adapted to the trapezial portion of the scapho-trapezial bone, the other is a larger convex surface, placed nearly at right angles to the preceding, and articulated with the trapezoides and the base of the second metacarpal bone.
328. The metacarpal bone of the third or middle digit of the right fore-foot. It is a short thick and strong bone, well adapted to sustain the digit which is armed by the largest claw. The four basal facets of the proximal articular surface are defined by sharp angles; the middle facet is smooth and concave; the outer or radial facet is nearly flat, and extends from the dorsal to the palmar aspect of the base; the ulnar facet meets the middle one at a well-defined angle; the ulnar side of the base of this metacarpal presents a moderate convexity, upon which the radial half of the base of the fourth metacarpal rests. The under or palmar surface of the shaft of the bone is flattened, and at right angles to the rugged outer and inner surfaces, the radial side is produced at its distal half into an oblong protuberance. The median ridge of the distal articulation is slightly concave in the vertical direction: the lateral depressions of the trochlea are very narrow, especially the ulnar one. A surface for a sesamoid bone is extended from the trochlea upon the right side of the under part of the distal joint.
329. The metacarpal bone of the fourth digit of the right fore-foot. This much exceeds the middle metacarpal in length; its base or proximal end is obliquely extended, and articulates with the middle metacarpal, the unciform bone, and the fifth metacarpal: the two oblique metacarpal surfaces are nearly parallel, and are separated by well-defined angles from the

middle carpal surface, which is nearly square and slightly concave. The distal articular surface presents a broad, convex vertical ridge, and a concavity on the radial side of that ridge; a single flat surface for a small sesamoid bone is situated below, but distinct from this part of the articulation.

330. The unguis phalanx of probably the second or index digit of the right fore-foot.

331. The unguis phalanx of the third or middle digit of probably the right fore-foot.

332. A cast in clay of the interior of the horny claw of the same phalanx.

333. The unguis phalanx of probably the fourth digit of the right fore-foot.

334. This bone is probably the second and terminal phalanx of the fifth digit of the right fore-foot. It has a rough obtuse termination, without any articular surface for a third or unguis phalanx, and without any modification indicative of the former attachment of a claw.

335. The head of the right femur.

336. The shaft and distal extremity of the right femur.

337. The left femur.

This bone of the hind-extremity is remarkable for its massive proportions, especially its great breadth: a slight emargination at the posterior circumference of the head of the bone is the sole vestige of the insertion of a ligamentum teres. The outer margin of the shaft forms a great angular projection above the outer condyle; the rotular surface is formed by a continuation of the articular surface of that condyle, which is separated by a rough isthmus from the inner condyle.

338. The left tibia and fibula: they are ankylosed to each other at both extremities. The distal articulation of the tibia is remarkable for the hemispherical excavation near its inner side for the reception of the protuberance of the astragalus.

339. The left astragalus. The chief characteristic of this bone is the convex protuberance formed by the inner half of the upper articular surface and the broad, convex outer portion of the same surface. The upper half of the surface for the os naviculare is concave; the posterior part of the surface for the calcaneum is separated from the remaining part by a deep and rough canal: the anterior part is continuous with the convex portion of the cuboido-navicular surface.
340. The left os calcis. This is very remarkable for its great size and the unusual prolongation of its posterior part.
341. The left os naviculare. The articular surface for the astragalus is nearly equally divided into an upper convexity and a lower concavity. The anterior part of the bone presents but two surfaces, for two cuneiform bones, which surfaces are continuous to a small part of their extent.
342. The left os cuboides. The articular surface which joins the astragalus is concave: the surface presented to the fifth metatarsal bone is set at right angles with that for the fourth metatarsal.
343. The internal and larger cuneiform bone. Its anterior convex articular surface shows that the base of the metatarsal bone which it supported was at least four inches in vertical and three inches in transverse extent, which agrees with the proportions of that bone in the figure by Bru and Pander of the Madrid skeleton. This metatarsal bone does not exist in the present collection of Megatherian remains.
344. The unguis phalanx of the third or middle toe of the left hind-foot. This toe, called the third from the analogy of the ordinary pentadactyle feet, is the innermost or first in the Megatherium, and the only one provided with a claw in the hind-foot.
345. The analogue of the second or middle cuneiform bone in Man, but the innermost of the two cuneiform bones in the Megatherium. Its proximal end or base is occupied by the long, narrow, undulating surface adapted to that on the os naviculare. On the outer or fibular side, near the upper end of the base of the bone, there is a flat, sub-circular articular surface,

which has been applied to a corresponding surface on the metatarsal bone of the third toe. This distal end of the bone has no articular surface for the support of a phalanx, but is as rough as the rest of the non-articular surface of the bone. This bone, therefore, establishes the fact of the absence of first and second toes in the hind-foot of the Megatherium, as represented in the figures of the Madrid skeleton by Bru and Pander.

The foregoing fossils of the Megatherium, from 234 to 345 inclusive, were presented by Sir Woodbine Parish, K.H.

- 346 A portion of the left temporal bone of a Megatherium, including the base of the zygomatic process and the shallow articular surface for the lower jaw.

From the cliffs of Bahia Blanca, Patagonia.

Presented by Charles Darwin, Esq., F.R.S.

347. A fragment of a molar of a Megatherium, with part of its socket.

From the cliffs at Bahia Blanca, Patagonia.

Presented by Charles Darwin, Esq., F.R.S.

Genus *Megalonyx*.

The following specimens, illustrative of the osteology of the *Megalonyx*, are casts of fossil bones discovered in one of the limestone-caverns called "White-cave" in Kentucky, or in "Big-bone-cave" Tennessee; both which localities are assigned to these fossils by Dr. Harlan, by whom the originals, now deposited in the Cabinet of the Academy of Natural Sciences of Philadelphia, have been described and figured*.

348. A portion of a molar tooth, including the termination of the pulp-cavity. It is slightly curved, in two directions, and resembles the tooth of the *Megalonyx Jeffersonii*, figured in Cuvier's *Ossemens Fossiles*, 8vo. ed. 1835, pl. 216, figs. 13 and 14, in being compressed, with the transverse

* Medical and Physical Researches, 8vo, 1835, p. 319. pl. xiii.

section forming a long ellipse; one side of the ellipse describes a regular convexity; the opposite side presents a median prominence, with a depression on each side, corresponding with a median ridge and two shallow channels which traverse the concave side of the tooth longitudinally. The long transverse diameter, does not exceed in so great a degree the short transverse diameter as in the tooth figured by Cuvier, but the proportion of the length to the breadth and thickness of the teeth compared cannot be determined, as both specimens are mutilated. With respect to those differences which are determinable, they are less than are presented by different teeth in the same jaw of the *Megatherium*, of the *Mylodon*, and of the *Scelidotherium*; and by no means warrant the specific, much less the generic distinction of the Tennessee *Megalonyx* from that discovered in the Cave in Green-briar County, Virginia, and described by Cuvier.

349. An anterior dorsal vertebra of a young *Megalonyx*: the epiphysial ends of the centrum are wanting.
350. The fractured neural arch of a dorsal vertebra. The costal articular surface on the transverse process is a convex protuberance.
351. A lumbar vertebra: there are two oblique or articular processes on each side of the anterior and on each side of the posterior part of the neural arch, showing that the vertebræ in this region were interlocked, as in the *Megatherium* and *Mylodon*, by a double tenon-and-mortice joint. All the preceding vertebræ exhibit the wide canal for the spinal chord which characterizes the *Megatherioid* animals generally.
352. A cast in wax of the scapula of a young *Megalonyx*. It resembles that of the *Mylodon* in the equality of its height and breadth, and in the almost equal partition of its outer surface by the spine. It has a large perforation, instead of a notch, near the anterior part of the supra-spinal fossa: if the termination of the fossa be over-arched in the *Megalonyx*, as in other *Megatherioid* animals, by the conjoined acromion and coracoid, this characteristic structure has either disappeared from accidental

- fracture or has not been completed, owing to the nonage of the individual. The glenoid cavity is a long and narrow vertical ellipse.
353. The cast of the humerus of a full-grown *Megalonyx*, from Big-bone-lick. It presents the general characters of this bone in the Megatherioid animals; the rotatory movements of the convex head were not interrupted by any inordinate development of the outer or inner tuberosities, although these are well marked. The large size of the supra-condyloid plates, which gave attachment to the pronator and supinator muscles, indicate, with the modifications of the distal articular surface, that the fore-foot could be freely rotated. The most marked character by which the humerus of the *Megalonyx* differs from that of the *Megatherium*, is the perforation of the internal condyloid plate. The articular surface presented to the ulna is convex, as in the *Megatherium*; in the *Mylodon* it is concave from side to side.
354. The shaft of the humerus of the young *Megalonyx*, from Big-bone-cave, Tennessee. It has lost its terminal epiphyses; but although the ridges and condyloid plates are less developed than in the old animal, the characteristic perforation of the internal condyle remains.
355. The ulna of the *Megalonyx Jeffersonii*, from the cavern in Green-briar County, Virginia. The original specimen from which the present cast was taken is described and figured by Cuvier, *Annales du Muséum*, tom. v. (1804) p. 372, pl. xiii. fig. 7.
356. The shaft of the ulna of the young *Megalonyx*, from Big-bone-cave, Tennessee. The olecranon and the distal extremity are broken off. The original is figured in Dr. Harlan's *Medical and Physical Researches*, pl. xiii. fig. 15.
357. The radius of the young *Megalonyx*, from Big-bone-cave, Tennessee. The head is concave and circular, as in the preceding specimen and in the *Megatherium*; the slight differences in the proportions of the shaft of this bone, as compared with the preceding specimen, belonging to the *Megalonyx Jeffersonii*, depend on the difference in the age of the indi-

viduals to which they belonged. The distal epiphysis has been detached from the present specimen.

358. The radius of the *Megalonyx Jeffersonii*, from the cavern in Green-briar County, Virginia.

The original specimen from which the present cast was made, is described and figured by Cuvier, *Annales du Muséum*, tom. v. (1804) p. 372, pl. xxiii.

359. The metacarpal bone of the index or second digit of the left fore-foot of the *Megalonyx Jeffersonii*. It is relatively longer and narrower than in the *Myodon*: the triangular base is more inequilateral, and its anterior emargination is deeper, but the flat surface on the radial side of the base of the bone, for the metacarpal of the pollex, resembles that of the *Myodon* rather than that of the *Megatherium*; whence it may be inferred that the entire pollex of the *Megalonyx* resembled that of the *Myodon*, instead of being reduced to a rudimental metacarpal bone as in the *Megatherium*. The original of this cast is described and figured by Cuvier, *loc. cit.*, p. 367, pl. xxiii. fig. 8.

360. The second phalanx of the second digit of the left fore-foot of the *Megalonyx Jeffersonii*.

361. The third or unguis phalanx of the second digit of the left fore-foot of the *Megalonyx Jeffersonii*.

362. The metacarpal bone of the third or middle digit of the left fore-foot of the *Megalonyx Jeffersonii*. The general proportions of this bone are very similar to those of its analogue in the *Myodon*, but in the more vertical position and greater projection of the distal articular ridge, and in the flatter under-surface of the bone, it more closely resembles that of the *Megatherium*. The articular surface on the radial side of the base of the present metacarpal is flat instead of being convex as in the *Myodon*, and adapted to a corresponding flat surface in the second metacarpal bone. The original of the present cast is described and figured by Cuvier, *loc. cit.*, p. 367, pl. xxiii. fig. 4.

363. The proximal phalanx of the middle digit of the left fore-foot of the *Megalonyx*: it differs from that of the *Mylodon* by its greater relative vertical diameter, and by the greater depth of the proximal and distal articular canals. This bone is described and figured by Cuvier, *loc. cit.*, p. 365, pl. xxiii. fig. 3.
364. The second phalanx of the same digit. It is twice as long in proportion to its breadth as the corresponding bone in the *Mylodon*, and is more symmetrical: the distal trochlea is narrower, but with a much deeper median canal. The median ridge of the proximal articulation is more developed, and the lower boundary of that articulation is more produced than in the *Mylodon*. This bone is described and figured by Cuvier, *loc. cit.*, p. 364, pl. xxiii. fig. 2.
365. The unguis phalanx of the same digit. It is much more compressed than the corresponding phalanx of the *Mylodon*; the median ridge of the articular trochlea is sharper: the position of the joint equally favours the downward inflection of the claw and prevents its retraction. Cuvier, in his description of this phalanx, proves, by a comparison of it with the unguis phalanges of the Sloth and Lion, that it could not have belonged to a gigantic carnivorous species, as was conjectured by Jefferson and Faujas: *loc. cit.*, p. 362, pl. xxiii. fig. 1.
366. The metacarpal bone of the fifth digit of the left fore-foot of the *Megalonyx Jeffersonii*. The proximal expansion presents two articular surfaces; a terminal one for the os unciforme, and a lateral one on the radial side for the adjoining surface of the fourth metacarpal. The distal end presents the same modifications as the fifth metacarpal in the *Mylodon*: a simple vertically-oblong surface supports an arthrodial instead of a ginglymoid joint for the proximal phalanx, below which there is a surface for a sesamoid bone; indicating that the digit which it supported was as mutilated and short as in the *Mylodon* and *Megatherium*.
367. This small unguis phalanx probably belongs to the first digit or pollex of the same fore-foot of the *Megalonyx* as the foregoing bones: it is described and figured by Cuvier, *loc. cit.*, p. 363, pl. xxiii. fig. 9.

368. The distal epiphysis of the right femur of a *Megalonyx*, from Big-bone-cave, Tennessee : this differs from the corresponding part of the thigh-bone in the *Megatherium*, *Myiodon* and *Scelidotherium* in having the rotular articular surface separate from the outer and inner condyloid surfaces. The internal condyle is more prominent and convex than the external one, in which respect the femur of the *Megalonyx* resembles that of the *Megatherium* more than that of the *Myiodon*.

The original is figured and described by Dr. Harlan, *Medical and Physical Researches*, p. 327, pl. xiv. fig. 19.

369. The left tibia, wanting the distal epiphysis, of a *Megalonyx*, from Big-bone-cave, Tennessee. The depth of the concave surface for the internal condyle agrees with the character above described in the distal articulation of the femur. The smaller surface for the outer condyle is slightly convex, raised above the level of the inner concavity, and confined to the posterior part of the outer half of the head of the tibia, which is rough anteriorly for ligamentous attachment. The original is figured and described by Dr. Harlan, *loc. cit.*, p. 328, pl. xiv. figs. 20 and 21.

370. The distal epiphysis of the right tibia of a *Megalonyx*. The articular surface is divided into three facets, but less conspicuously than in the *Megatherium* or *Myiodon*. The anterior facet is concave, and was adapted to the anterior convex protuberance of the astragalus which characterizes that bone in the *Megatherioid* animals : it is narrower vertically, but broader and shallower than in the *Megatherium* or *Myiodon* : the posterior and largest surface is concave on the inner and convex on the outer half, but slightly so in both : the outer surface slopes upwards from the middle or posterior surface, holding the place of the outer malleolus as in other *Megatherioids*, and was adapted to the upper of the two distal articular surfaces in the fibula. The inner malleolus is slightly produced, and is characterized by the wide and deep oblique groove at its posterior part, separating it from the articular surface. The original specimen is described and figured by Dr. Harlan, *loc. cit.*, p. 329, pl. xiv. fig. 23.

371. The right os calcis of the *Megalonyx*, from Big-bone-cave, Tennessee. It

differs from that of the *Mylodon* and agrees with that of the *Megatherium* in having the surface for the astragalus separated into two by an intervening rough tract ; it differs from both in having the cuboidal surface separated from the astragalar surface, but is most remarkable for the form of the posterior projection, which is much compressed, and expands into a broad vertical plate of bone, thus resembling the form of the os calcis in the Sloths more than does that of any other Megatherioid animal. The outer and anterior angle supporting part of the cuboidal articulation is broken off. The original specimen is described and figured by Dr. Harlan as the 'os ilium' of the *Megalonyx*, *loc. cit.*, p. 336, pl. xvi.

372. The os calcis of a younger *Megalonyx*, from Big-bone-cave, Tennessee. It is more fractured than the preceding specimen, but shows the same modification of the anterior articular surfaces and of the posterior projecting part. The original is figured and described by Dr. Harlan, *loc. cit.*, p. 329, pl. xiv. figs. 23 and 24.
373. The unguis phalanx or claw-bone of the median digit, of probably the hind-foot of a *Megalonyx*. It resembles that of the *Megatherium* in its great depth, but is more compressed: the osseous sheath has been broken away; its inferior base forms a convex protuberance, which is notched on each side, posteriorly, for the transit of the vessel which nourished the enormous claw.
374. The corresponding claw-bone, probably of the adjoining toe: it presents the same general characters, but is somewhat smaller, and the base of the osseous sheath, here likewise broken away, is flattened.
375. The anterior half of a claw-bone, of similar form, but intermediate in size between the two preceding specimens.

The foregoing casts of the Megalonyx Jeffersonii, from 348 to 375 inclusive, were presented by Dr. Richard Harlan.

376. The horizontal rami and symphysis of the lower jaw of a *Megalonyx*.
The jaw is deeply and firmly imbedded in a matrix, consisting of quartz

pebbles cemented together by calcareous matter, so that only the upper or alveolar border is visible. The coronoid and condyloid processes are broken away, and the texture of the remaining part of the jaw is too friable, and adheres too firmly to the surrounding matrix, to admit of more of its form being ascertained.

There were four molars on each side of this jaw ; the large oblique perforation near the fractured symphysis is the anterior extremity of the wide dental canal. The forms of the alveoli are best preserved in the right ramus ; the first is the smallest and seems to have contained a tooth, of which the transverse section must have been simply elliptical : the second tooth is preserved *in situ* ; it is laterally compressed, but the transverse section is ovate, the great end being turned forwards : the third socket presents a corresponding form, but a larger size : the fourth socket is too much mutilated to allow of a correct opinion being formed as to the shape of the tooth which it once contained.

From the Cliffs at Punta Alta, Bahia Blanca, near Patagonia.

Presented by Charles Darwin, Esq., F.R.S.

Genus *Mylodon*.

377. The skeleton of the *Mylodon robustus*, OWEN.

This skeleton was discovered in the year 1841, by M. Pedro de Angelis, seven leagues north of the city of Buenos Ayres, in the fluvial deposits constituting the extensive plain intersected by the great Rio Plata and its tributaries.

It is remarkable for the great strength which is indicated by its robust proportions, and by the powerful development of the ridges and by processes for the attachment of muscles.

The trunk, which is shorter than that of the Hippopotamus, is terminated behind by a pelvis, equalling in breadth and exceeding in depth that of the Elephant. This capacious bony basin rests on two massive but short hind extremities, terminated by feet as long as the femora, set at right angles to the leg, as in the plantigrade animals, but with the

sole slightly turned inwards. A tail equalling the hind limbs in length, and proportionally as thick and strong, assists in supporting the broad pelvis.

The sacrum is lengthened by the anchylosis of the lumbar vertebræ.

A long and capacious thorax is defended by sixteen pairs of ribs, most of which equal in breadth those of the Elephant, and all the true ribs are clamped by massive and completely ossified cartilages to a strong and complicated sternum.

The scapulæ, distinguished by their unusual breadth, and by the osseous arch connecting the acromial and coracoid processes, are attached to the large manubrium sterni by strong and complete clavicles.

The humeri, short and thick, like the femora, have their muscular processes, ridges and condyles still more strongly developed; but the rotatory and lateral movements are not obstructed by any inordinate production of the proximal tuberosities.

The fore-arm is longer than its corresponding segment in the hind limb, has both bones distinct, and equally remarkable for their great breadth and the angular form, occasioned by the prominence of the intermuscular ridges: yet the mechanism for free pronation and supination is complete.

The fore-foot is pentadactyle, and of great breadth and strength; but so unusually massive are the proportions of the radius and ulna, that it appears relatively small; and notwithstanding certain fingers are terminated by claw-bones of great size and length, yet, owing to the form of their proximal phalanges and metacarpal bones, it is short in proportion to its breadth.

The hind-foot is tetradactyle, with the two inner toes elongated and armed with unequal but large claws.

Both the fore and hind feet are remarkable for the shortness, breadth and ungulate character of the two outer digits, which, when the *Mylodon* stood or trod upon the ground, must have principally sustained the superincumbent weight.

A skull smaller than that of the Ox, but long, narrow, and terminated

by a truncated muzzle, is supported by a short neck composed of seven cervical vertebræ. These vertebræ are freely articulated together, and are succeeded by sixteen dorsal or costal vertebræ, remarkable for their broad and high spinous processes, which are nearly equal and have an uniform inclination backwards.

The most extraordinary features which this surface presents are accidental to the individual example under consideration, and arise out of two extensive fractures of the skull, which the animal had received some time before its death; one of these fractures is four inches in length, and extends, in the axis of the skull, across the fronto-maxillary suture near the right orbit.

The blow has depressed the outer table of the skull, but the fracture is entirely healed and is indicated by the furrows, along which the bone sinks below its natural level into the large frontal sinuses. The surface of the supra-orbital plate, which has participated in the primary injury and been affected by the inflammation consequent thereon, is roughened, and, as it were, eaten into by numerous small vascular grooves and fissures.

The second fracture is more extensive, and affects the middle of the posterior part of the parietal region of the skull, extending a little way into the occipital region. The outer table of the skull has been smashed in for an extent of five inches in the long diameter and three inches transversely: several of the bony fragments have exfoliated and left wide irregular apertures leading into the large air sinuses, which are continued from the frontal to the occipital regions.

The margins of the broken bone, both of the outer table and the exposed edges of the vertical sinuous walls, extending between the outer and inner tables, are rounded off by the absorbent action, and are thickened irregularly by new ossific depositions, which shoot out in the form of jagged exostoses from the posterior and narrower end of the fractured surface.

The inner table of the skull has not been injured by the blow which caused such destruction to the outer plate; and the integrity of the cranial cavity, and the safety of the contained cerebral organ, may be

ascribed to the singular extension and development of the air-cells, which raise the outer considerably above the vitreous table, along the whole upper plane of the skull.

An explanation of the probable cause of these fractures, and a detailed account and comparison of all the bones in the present unique skeleton, are given in the separate work, published by the College, entitled 'Description of the Skeleton of an extinct Gigantic Sloth (*Myiodon robustus*),' &c., 4to, 1842. *Purchased.*

The following fossils to No. 470 inclusive belong to the species called *Myiodon robustus*, and are from the same stratum and locality as the skeleton.

378. The first molar tooth, right side, upper jaw. It is more curved, and is separated by a wider interval from the rest than they are from each other, whereby it offers an obvious resemblance to the so-called canine of the Two-toed Sloth (*Cholæpus didactylus*, Illig.), but it is not larger than the rest of the molar series. The present example is much broken. *Purchased.*
379. The first molar tooth, left side, upper jaw. A transverse section has been taken from the crown or exposed part, and the surface polished. The densest constituent shines most; it consists of hard or unvascular dentine, surrounds the trihedral axis of the vascular dentine, and is itself surrounded by the thin coat of cement. The progress of carbonization has followed the course of the calcigerous tubes of the dentine, which are thus demonstrated to the naked eye. *Purchased.*
380. The second molar, left side, upper jaw. The grinding surface has been broken off: the course of the calcigerous tubes of the hard dentine may be discerned on the fractured surface with the aid of a pocket-lens. *Purchased.*
381. A portion of the third molar, left side, upper jaw, including the grinding surface of the tooth. *Purchased.*
382. A considerable portion of the fourth molar, left side, upper jaw; the grinding surface is nearly entire. *Purchased.*

383. The fifth and last molar, left side, upper jaw. *Purchased.*
384. A portion of the first molar tooth, right side, upper jaw. *Purchased.*
385. The fourth molar tooth, right side, upper jaw: the transverse striæ on the outer surface of the cement are well displayed in this specimen. *Purchased.*
386. The fifth and last molar tooth, right side, upper jaw. *Purchased.*
387. The third molar, left side, lower jaw. The grinding surface is obliquely fractured. *Purchased.*
388. The fourth and last molar, left side, lower jaw. This is the largest and most complicated tooth of the series, resembling two simple molars joined together lengthwise. *Purchased.*
389. A portion of the third molar, right side, lower jaw; including the grinding surface. *Purchased.*
390. A portion of the right ramus of the lower jaw of the *Mylodon robustus*, including the two posterior molar teeth and part of the socket of the second molar, with a portion of the coronoid and angular processes and the commencement or entry of the great dental canal. *Purchased.*
391. The symphysis of the lower jaw of the *Mylodon robustus*. This part forms the most remarkable feature of the lower jaw and resembles the blade of a spade; it is inclined from below upwards and forwards at an angle of 130° with the basal line, as a broad, nearly square plate of bone, diminishing in thickness to its upper margin, which is nearly straight. The trenchant anterior edge is a little roughened for the attachment doubtless of a callous gum; it offers no trace of incisive sockets; it forms a right angle with the lateral margins of the symphysis, which are slightly concave; each angle is rounded off. The inner surface of the symphysis is smooth and concave at its anterior half, convex vertically at its lower half; but here, also, smooth, and without any ridge or process indicating attachments of genio-hyoid or genio-glossal muscles.

Its size, form and position strongly indicate that it supported and facilitated the movements of a large and probably long and prehensile muscular tongue.

The outer surface of the symphysis is rough and irregular, slightly concave, and with an oblique eminence on each side of the middle line. These eminences indicate the place of origin of the retractors of the lower lip. *Purchased.*

392. A portion of the malar bone of a *Myiodon robustus*, showing the descending process, which characterizes the existing Sloths and the extinct species of the Megatherioid family. *Purchased.*

393. The body and left cornu majus of the os hyoides of the *Myiodon robustus*.

The part of the body of the os hyoides included between the articular tubercles for the anterior cornua is short, subcylindrical, and of less vertical diameter than the anchylosed posterior cornua. A rather thick and rough convex ridge projects downwards from the anterior extremities of these processes, doubtless for the attachment of strong thyro-hyoidei muscles; two slight tuberosities on the front of the body, below the articular tubercles, indicate the insertions of the sterno-hyoidei muscles.

Purchased.

394. The hyoid articular extremity of the right stylo-hyal bone of the *Myiodon robustus*. *Purchased.*

395. The left stylo-hyal bone of the *Myiodon robustus*. *Purchased.*

396. A fragment of the body of a dorsal vertebra of the *Myiodon robustus*. *Purchased.*

397. A fragment of the body of, apparently, the last dorsal vertebra of the *Myiodon robustus*: it exhibits the deep excavations upon the under surface which are noticed in the description of the skeleton. *Purchased.*

398. The bodies of the three anchylosed lumbar vertebræ of the *Myiodon robustus*. The flat surface which the first lumbar presents to the last dorsal vertebra corresponds with the form of the same articulation in the entire skeleton: the portion of the first sacral vertebra, which is anchylosed

- to the third lumbar, has been broken away from the rest of the sacrum. The extent of the ossified intervertebral substance which connects the lumbar vertebræ with each other and with the sacrum is clearly defined on the floor of the spinal canal. The body of each lumbar vertebra is perforated in the centre by a vertical vascular canal; that of the middle lumbar is the largest and most regular in its form; it bifurcates near its lower extremity. The gradual expansion of the capacious spinal canal as it approaches the sacrum is deserving of notice in this specimen; as also the sudden dilatation in the canal or foramen for the last lumbar nerve, corresponding with the large ganglion of the posterior root of that nerve. *Purchased.*
399. The proximal end of one of the posterior vertebral ribs, showing a single articular surface upon the head. *Purchased.*
400. A fragment of a vertebral rib of the *Mylodon robustus*. *Purchased.*
401. An ossified sternal rib of the *Mylodon robustus*, wanting the end which articulates with the vertebral rib, but having two distinct articular surfaces at the sternal end, and showing also a portion of the flat articular surface for the adjoining sternal rib. *Purchased.*
402. The sternal extremity of a sternal rib of the *Mylodon robustus*, showing two distinct articular surfaces; the upper one is again subdivided into two, for the complicated joint with the sternum. *Purchased.*
403. The sternal end of a sternal rib of the *Mylodon robustus*, showing two articular surfaces for the sternum. *Purchased.*
404. The sternal extremity of a sternal rib of the *Mylodon robustus*, showing two articular surfaces for the sternum. *Purchased.*
405. A similar specimen. *Purchased.*
406. A similar specimen. *Purchased.*
407. A portion of a sternal rib of the *Mylodon robustus*. *Purchased.*
408. One of the sternal ribs of the *Mylodon robustus*, showing the flat sub-

circular articular surface by which it was connected with the contiguous sternal rib. *Purchased.*

409. A fragment of a sternal rib of the *Myiodon robustus*, showing a part of the surface for articulation with an adjoining sternal rib. *Purchased.*

410. A portion of another sternal rib, probably the last but one on the left side, of the *Myiodon robustus*, showing the sternal articulation, which is divided into three surfaces. *Purchased.*

411. The sternal bone with which the preceding rib was articulated: it is probably the penultimate one of the series, having the distal surface for the succeeding sternal bone continuous with the two surfaces for the corresponding sternal ribs. The distinction of the anterior and posterior parts of the sternal bone is maintained at the upper end, which exhibits one surface for the contiguous sternal bone, and four surfaces for the sternal ribs. *Purchased.*

412. The proximal end of the left humerus of the *Myiodon robustus*, showing the articular surface and the two tuberosities.

The tuberosities, though not elevated so as to interfere with the rotation of the head of the bone, as in the large ungulate quadrupeds, are broad and well-defined. The rough deltoidal tract covers a great portion of the fore-part of the shaft of the bone, from which it is separated by a more or less prominent marginal ridge. The pectoral ridge is well-marked. The musculo-spiral impression presents an unusual width and depth. *Purchased.*

413. The shaft and distal end of the right humerus of a *Myiodon robustus*; the external supra-condyloid plate is broken off. The trochlear articulation for the bones of the fore-arm indicates, by the regular convexity which it presents to the radius, the free rotation of that bone.

In its general characters the humerus of the *Myiodon* resembles that of the *Megalonyx* and *Megatherium*; but it differs in its greater strength, the shaft being relatively much thicker with a stronger deltoidal platform, and the proximal tuberosities larger and higher, particularly the external one. The humerus of the *Myiodon* differs in a more marked

respect from that of the *Megalonyx*, in the absence of the perforation of the internal condyle, which in the *Myiodon* is simply notched at its upper part by the brachial nerve and vessels as in the *Megatherium*; but the notch is less strongly marked in the more gigantic species.

The form of the articular surface for the ulna offers another well-marked distinction between the *Myiodon* and *Megalonyx*. In the latter species, and likewise, to judge from the figures of Bru and Pander, in the *Megatherium*, this part of the distal articular surface of the humerus is convex in every direction: in the *Myiodon* it is only convex, and that in a very slight degree, from before backwards, and is concave from side to side.

Purchased.

414. A longitudinal section of the left humerus of the *Myiodon robustus*: it shows the course of the canal for the medullary artery, which enters the bone a little way above the inner condyloid plate, and passes slightly upwards in a straight line to an oblong cell four lines in diameter, which is the sole rudiment of the medullary cavity in this bone. The compact wall of the humerus is thickest near its middle part where the medullary canal exists; it diminishes to a depth of one or two lines at the extremities of the bone, the included substance presenting a nearly uniform and close cancellous texture.

Purchased.

415. The opposite section of the same bone.

Purchased.

416. A portion of the proximal half of the right ulna of the *Myiodon robustus*, showing the smaller sigmoid cavity for the head of the radius.

Purchased.

417. The proximal half of the left ulna of the *Myiodon robustus*, showing the slightly concave surface adapted to the inner condyle of the humerus.

The olecranon is bent obliquely inwards; the broad and rough back part of the olecranon gradually contracts into the posterior flattened border of the ulna. The great sigmoid or rather reniform articular surface extends almost transversely across the base of the olecranon, and plays upon the inner and back part of the outer condyle of the humerus, being divided by a median convexity into two compartments; the inner

portion is produced forwards upon the anterior angle of the ulna, and is very slightly concave; the outer division is more deeply excavated. The articular surface is continued for a few lines upon the large rough depression for the head of the radius. *Purchased.*

418. The proximal part of the right radius of the *Mylodon robustus*. *Purchased.*

419. The distal extremity of the same radius.

The radius of the *Mylodon* is thicker in proportion to its length, stronger and much more deeply impressed by the muscles of the forearm, more especially by the extensors of the hand, than in the *Megatherium* or *Megalonyx*: it differs in the shape of the proximal articular cavity, which is more oblong: the marginal surface which rotates upon the ulna is narrower and more convex. The rough tuberosity for the insertion of the biceps is further from the proximal joint and more advantageously situated for the action of the muscles in the *Mylodon*. The rough external margin of the radius, which in the *Megatherium* partially subsides and becomes thinner as it extends downwards, and which would appear to stand out as a distinct process in the Madrid specimen, gradually increases in the *Mylodon* until it expands into the tuberosity above the styloid process. *Purchased.*

420. A fragment of the distal extremity of the left radius of probably the same individual: it includes the styloid process which is adapted to the concavity of the articular surface of the scapho-trapezial bone.

The anterior part of the distal end of the radius is more concave in the *Mylodon* than in the *Megatherium*, and the distal articular extremity has its posterior boundary shorter transversely, and more produced downwards. *Purchased.*

421. A longitudinal section of the left radius of the *Mylodon robustus*, showing the absence of a medullary cavity: the cancellous texture which occupies the centre of the bone is of somewhat coarser character than in the humerus. *Purchased.*

422. The opposite section of the same bone.

Purchased.

The following bones, from No. 423 to No. 440 inclusive, belong to the same right fore-foot of the *Myiodon robustus*, are from the same stratum and locality as the skeleton, and were purchased by the College.

423. The scapho-trapezium bone.

The os scaphoides, besides its usual relations to the radius, lunare and trapezoides, sends down a process which represents the os trapezium, and supports the metacarpal bone of the thumb. This process, or confluent bone, gives to the scaphoid an unciform figure. It is short or depressed in the direction of the axis of the limb, broad from side to side, convex towards the back of the corpus, and made concave on the opposite side by the production of the two angles, and especially of that formed by the ankylosed trapezium. The articulation of the radius covers all the proximal surface save the trapezium angle. The articular surface is continued at right angles to its radial portion upon part of the ulnar side of the scaphoid for the junction with the os lunare. The distal surface of the scapho-trapezium bone is excavated by two concave articular surfaces for the os magnum and trapezoides: these surfaces are separated by a rough concavity from the small and nearly flat one, at the outer side of the trapezium process, for the metacarpal bone of the thumb.

424. The os cuneiforme.

The os cuneiforme, or triquetrum, is the largest of the carpal bones and approaches to the cubical figure: the rough quadrilateral dorsal surface is nearly flat, with an oblong protuberance near the radial margin, and a concavity above the edge of the lower articular surface. The upper or proximal end presents an almost square, flat articular surface for the truncated distal end of the ulna, which surface bends over upon the outer and posterior surface of the bone, to form the slightly convex semi-oval articulation for the os pisiforme. The articular surface of the opposite side for the lunare is divided by a rough tract from the ulnar surface, but is continuous with the broad and slightly sinuous one, by which the

cuneiforme articulates with the unciform bone : on the outer or ulnar side of this surface, a small articular facet is marked off, by which the os cuneiforme assists in supporting the huge metacarpal bone of the little finger. Thus the proximal row of carpal bones is brought into contact with the metacarpal series at both its extremities, and circumscribes, with this series, the space including the three distinct bones of the second carpal row.

425. The trapezoides.

The proximal articular surface connecting the trapezoides with the scaphoid proper is semicircular and slightly convex ; that which joins with the os magnum is a small circular, subconcave surface. The distal articular surface supporting the second or index metacarpal is convex next the dorsal part of the carpus, and concave towards the palmar side, in the vertical direction, with opposite curvatures in the transverse direction.

426. The os magnum.

This carpal bone is wedged in between the scaphoides, lunare, trapezoides, unciforme and middle metacarpal bone, and its rugged dorsal surface is bounded by sides corresponding with each of these bones ; of these the one connected with the scaphoid is the shortest, that joined to the metacarpal bone is the longest : towards the dorsal part of the carpus this surface is divided into two parts by a rough depression ; on the opposite or palmar side a small portion of the articular surface is bent outwards at a right angle, so as to support part of the second metacarpal bone. The chief part of the proximal surface of the os magnum is convex, and is received into the concavity of the os lunare.

427. The os unciforme.

The unciform bone has a flat dorsal surface bounded by five sides, and supporting an oblong protuberance extending from the radial margin to the middle of the dorsal surface. Part of the radial side of the dorsal surface bounds a slight vacuity between the os cuneiforme and os

magnum. The two proximal sides are nearly straight; one is formed by the dorsal margin of the articulation between the unciforme and the lunare, the other by the more extensive one between the unciforme and cuneiforme. The three distal surfaces are articulated with part of the base of the third, fourth and fifth metacarpal bones. The palmar side of the unciforme presents, as its most striking character, a wedge-shaped process, convex on both sides, which is impacted in the interspace between the lunar and cuneiform bones: immediately below this process the surface is excavated and then swells out into a rough tuberosity near the margins of the articular surfaces, by which the unciforme is united with the third metacarpal. This surface is divided from that for the os magnum by a narrow rough channel. The six articular surfaces covering the rest of the circumference of the bone are uninterruptedly continuous; so that the rough dorsal and palmar surfaces of the bone are connected by a similar non-articular tract along the radial, instead of the ulnar margin.

428. The metacarpal bone of the pollex or innermost digit.

This bone presents a very singular and anomalous figure in consequence of a thick and short process which is sent off from the ulnar side of its base, which gives it the appearance of being bent at a right angle. By this form it acquires two distinct proximal articulations or points of support; one at its base, or in the nominal position, by which it joins that process of the scaphoides which represents the trapezium; the other on the before-mentioned process, with its plane at right angles to the basal articulation, and abutting upon the proximal end of the adjoining metacarpal. An oblong subangular eminence extends along the dorsal surface of the first metacarpal; a convex rough protuberance projects from the palmar aspect of its base, and is divided from a smaller protuberance beyond it by a deep transverse groove. The two articular surfaces at the proximal end of the bone are quite flat: the distal articular surface is a simple elliptical smooth convexity, occupying little more than the ulnar half of the distal end of the bone: two small smooth angular surfaces at the lower end of the articulation indicate the sesamoid bones at the palmar aspect of this joint of the thumb.

429. The metacarpal bone of the second or index digit.
430. The metacarpal bone of the third digit.
431. The metacarpal bone of the fourth digit.
432. The metacarpal bone of the fifth digit.
433. The first or proximal phalanx of the pollex.
434. The distal or unguis phalanx of the same.
435. The proximal phalanx of the second digit.
436. The middle phalanx of the same digit.
437. The distal or unguis phalanx of the same digit.
438. The proximal phalanx of the middle digit.
439. The middle phalanx of the same digit.
440. The unguis phalanx of the same digit.
441. The proximal half of the right femur of the *Myiodon robustus* : in this bone may be noticed the depression in the posterior part of the head for the attachment of the ligamentum rotundum : the fractured end demonstrates the absence of a medullary cavity.

The head, supporting the smooth surface presented to the acetabulum, is hemispherical : the articular hemisphere is directed obliquely upwards and inwards, encroached upon at the middle of its posterior margin by the oblong and moderately deep depression for the ligament ; the rest of its circumference is slightly sinuous and anteriorly overhangs the shaft. The upper part of the neck of the femur expands as it passes obliquely from behind forwards to the great trochanter, which scarcely rises above the horizontal line of the neck, and is on a lower level than the head. This trochanter is flattened at its summit and outer side, these surfaces meeting at a right angle : it is produced both forwards and backwards, but chiefly in the latter direction, where it descends like a strong round

column or buttress along the outside of a large and deep cavity before it subsides into the level of the shaft. Viewed from the outer side, the broad external rugged surface of the great trochanter hides the rest of the proximal third of the femur from view, so much does it surpass that and every other part of the bone in antero-posterior diameter. It gradually contracts to form the strong external ridge which descends, interrupted by only a slight emargination to be continued into that which surmounts the external condyle.

The anterior production of the great trochanter is narrower and more rugged than the posterior one; it is also flattened and separated by a ridge from the outer convex surface of the process, with which it is placed nearly at right angles: the external border of the shaft of the femur seems to be more immediately continued from the lower angle of the anterior surface of the trochanter, and is slightly bent forwards, bounding the concavity which extends along the outer third of the anterior surface of the shaft of the femur. The small trochanter is a vertically oval depressed tuberosity, situated directly upon the inner border of the femur two inches below the head, from which it is separated by a smooth and shallow concavity. The posterior intertrochanterian space is smooth and convex, except where it sinks into the cavity which partly undermines the posterior columnar prominence of the great trochanter.

Purchased.

442. The right tibia of the *Mylodon robustus*: the proximal articulation for the fibula and the surface for the outer condyle of the femur are broken off: the articular depression for the inner condyle is elliptical and occupies the whole of the corresponding division of the head of the tibia: a small portion of its anterior part is convex and rises to a slight eminence near the middle excavation, the rest of the surface is slightly concave.

The shaft of the tibia swells out anteriorly into irregular rough convexities, forms a smoother border about the inner articular surface, and falls in on every side to the lower third of the shaft, at the beginning of which the bone presents its smallest circumference. The anterior surface below the proximal rough swelling is flattened, and meets the

posterior surface at a concave edge externally; the inner concave border of the shaft is thick and rounded. A short rough ridge is continued from the middle of the anterior proximal tuberosity obliquely downwards and inwards. Fine reticular risings mark the smoother parts of the anterior surface. A broad but shallow groove runs from the lower part of the outer concave edge downwards upon the anterior surface of the expanded distal end of the bone. The outer malleolus projects as a somewhat square-shaped protuberance. The opposite side of the distal end, or the inner malleolus, forms a less prominent convex tuberosity. The posterior surface of the tibia is smooth at the concavity beneath the overhanging fibular articulation, and along the outer half of the posterior surface as far as the rugged rising which overhangs the distal articular surface. The inner half of the back part of the tibia presents a rough elevated tract, which extends across its upper part a little below the convex boundary of the condyloid articular surface: a thick rough ridge extends downwards to the middle of the internal concave border of the shaft: a narrow ridge descends along the middle of the upper half of the posterior surface and then divides, the inner branch extending obliquely to the angle terminating the concavity of the inner margin of the shaft. Below this ridge a wide and deep canal extends obliquely from above downwards and inwards, its lower edge being about an inch above the distal articular margin: this deep posterior excavation forms a well-marked character of the internal malleolus, and indicates prodigious strength in the flexors of the toes and adductors of the foot.

The distal articular surface of the tibia presents the most singular modifications: it is divided into three compartments, which are well-defined, although the synovial surface is uninterrupted. The external compartment is semi-elliptical, flat, nearly horizontal, inclining from without inwards and downwards; it forms the lower surface of the outer distal protuberance of the bone, and rests upon a corresponding surface at the lower part of that excavation of the fibula which receives the said protuberance. The second compartment of the distal articulation of the tibia is slightly concave, of a crescentic figure, with the bones directed inwards and forwards: its plane is more nearly horizontal than the fibular facet.

The third compartment is formed as it were by an excavation of the anterior and inner side of the distal articular surface, causing the concavity of the preceding crescentic surface, and the wide and deep semicircular notch which characterizes the fore-part of the distal end of the tibia. The third and the crescentic compartments of the distal articulation are exclusively articulated with the astragalus, the singular form of which they sufficiently indicate. The inner margin of the anterior excavation is pierced by a row of deep vertical canals. *Purchased.*

The following bones, from 443 to 452 inclusive, belong to the same left hind-foot of the *Myiodon robustus*, are from the same stratum and locality as the skeleton, and were purchased by the College.

443. The astragalus.

This characteristic bone, when in its natural relations with the rest of the tarsus, has its fibular or outer side uppermost, and the articular surface of the tibia looks inwards; when articulated, therefore, to the leg, placed vertically above it, the foot rests upon the ground by its outer edge, not by its sole, and the peculiarities of the metatarsal structure relate to this inversion of the foot. The articular surface which the astragalus presents to the bones of the leg is divided into three parts, the general planes of which are at right angles to each other; the surface, which in the naturally inverted position of the foot is horizontal, presents a uniform figure: it is slightly convex anteriorly, concave in a less degree posteriorly: at the antero-lateral part of its outer convex border the articulation adapted to the malleolar process of the fibula is continued upon the external surface: that which answers to the inner malleolus presents the form of a full convex semi-elliptical tuber, which ascends to fill the corresponding concavity or excavation on the inner side of the distal articulation of the tibia; below the extremity of this surface the astragalus swells out into an oblong tubercle, and below this there is a wide channel sinking into a deep depression at the fore and at the back part of the base of the above process; the canal and the two depressions separating this part of the astragalus from the calcaneo-navicular articu-

lation. In these depressions open many large vascular canals. A third rough and perforated depression separates the fibular articular surface from the cuboidal one: a more shallow depression marks the outer side of the astragalus behind the fibular surface. The inferior and anterior part of the astragalus is occupied by one extensive elongated articular surface adapted to the calcaneum, cuboides and naviculare. The navicular surface is flat on its upper half, convex on its lower half; the latter part being continued uninterruptedly into the convex cuboidal surface; the calcaneal surface, which is continued backwards from the cuboidal one, is elongated, being continued to the posterior apex of the bone; it is rather narrow, and is constricted near its anterior part at its posterior extremity.

444. The os calcis.

This bone, which equals in size the os calcis of the Elephant, is chiefly remarkable for the great breadth and length of its rugged posterior portion, for its broad, concave, triangular bases, perforated by many large vascular foramina, and for the large and deep tendinous groove, sometimes converted into a canal at the outer side of the bone: this canal or groove is nearly an inch in diameter. Above it, at the anterior part of the outside of the bone, there is a wider and shallower canal with a less smooth surface, bounded above by a small tuberosity and in front by a depression and a second tuberosity; the broad and deep outer surface of the calcaneum behind the foregoing canals is of a rhomboidal figure and is slightly concave, separated from the inferior surface by a broad, rugged, elevated border, and from the superior articular surface by a well-defined margin. The posterior surface of the calcaneum is high but narrow, rising from the tuberosity of the heel obliquely upwards with a gentle concave curve to the superior surface, from which it is separated by a small rugged tubercle: this tubercle, and a corresponding one on the extremity of the astragalus above, indicate the points of attachment of a strong posterior ligament. The inner surface of the calcaneum is separated from the posterior surface by a broad and rugged oblique ridge: it gradually deepens to a wide concavity bounded by three large

tuberosities, one above, which supports the inner extremity of the astragalus articulation ; another below, forming the internal and anterior angle of the inferior subconcave surface ; the third in front, constituting the anterior prolongation of that surface. There is but one articular surface in the os calcis of the *Mylodon*, which occupies the whole of the narrow superior facet, and bends down over part of the anterior surface : the upper division of the articular surface supports the astragalus ; it is slightly concave transversely, convex from behind forwards at its middle part : its breadth is not quite equal to the surface of the astragalus which plays upon it, and it is evident that a certain freedom of lateral motion was allowed between these two bones. The anterior deflected division of this long and narrow articular surface is equal to one-fourth of its entire extent ; it is slightly concave, and adapted to the os cuboides.

445. The os cuboides

The os cuboides has the form rather of a thick and short wedge, the base of which is formed by the rough flat subquadrate surface, which appears at the upper and outer part of the tarsus ; the outer and anterior margin of this surface is developed into a rough eminence. On the outer side of the cuboides, there is a slightly convex surface for the calcaneum, the whole of the back part is excavated to receive the astragalus tuberosity ; a narrow vertical strip of articular surface on the inner surface joins the navicular, and these three facets are continuous with each other. At the fore and upper part of the inner side of the cuboides, there is a small surface which touches the base of the third metacarpus, this is separated from the navicular strip by a rough depression bounding the interspace between the cuboid and adjoining cuneiform bone ; the anterior surface of the cuboides supports a very large articulation divided by a vertical narrow groove into two parts, for the two outer metatarsal bones. The under part of the cuboides is excavated by a rough depression, bounded anteriorly by a rugged protuberance. Although the cuboides articulates with six distinct bones, it has only two distinct smooth articular tracts, that for the middle metatarsal being continuous with the large outer metatarsal surface.

The os cuboides receives the superincumbent weight from the astragalus and naviculare, and transmits it to the os calcis, and to the three outer metatarsal bones.

446. The os naviculare.

The naviculare is an irregular, thick, oval plate of bone, concave towards the astragalus, convex next the metatarsus. Its thickest part is towards the upper and outer end, where the articular surface for the astragalus is slightly convex; the rest of that surface which extends to the tibial and lower border of the naviculare is concave; the upper and posterior border of the bone presents accordingly a sigmoid curve. The thickest part of the margin of the bone, which is above the convex articulation with the astragalus, is rough and flattened: the angle between this and the outer margin is formed by a thick tuberosity, only a small part of the anterior convex surface is modified for articular union, and this part presents two distinct surfaces for two cuneiform bones: of these articulations the outer is more than double the extent of the inner one, and one forms an oval of one inch and a half by one inch in diameter; it is gently convex and situated towards the lower half of the fibular part of the anterior surface: the outer surface is about ten lines by seven lines in extent, situated, with its long axis transversely, close to the inner margin of the line, nearer the lower than the upper margin, and separated by an uneven, non-articular tract of nearly half an inch in extent from the external cuneiform surface.

447. The external os cuneiforme.

A vacant interspace in the skeleton divides the cuboid from the external cuneiform bone, which has the usual triangular form, with the base shorter than the sides: it presents only two articular surfaces, a posterior one, slightly concave, for the naviculare, and an anterior one, in a less degree convex, for the oblique base of the middle metatarsal; the outer angle of the base of the anterior surface is more produced than that of the posterior surface. The external cuneiform diminishes in antero-posterior thickness from the base towards the apex, which is rounded off. The three margins of the bone are flat or slightly convex, rough and

perforated by vessels : there is no trace of an articular surface for the cuboides on the outer margin, or for a middle cuneiform bone on the inner one. The single articular surface for a cuneiform bone to the inner side of the preceding is separated by a non-articular surface of two lines in breadth, indicating that there was only one cuneiform bone and one toe on the inner side of the outer cuneiform bone and third toe.

448. The proximal phalanx of the innermost toe, which corresponds to the second toe in the pentadactyle foot of ordinary mammals.

The second phalanx, though small, is larger in proportion to its breadth than in the great adjoining toe : it is slightly compressed, with the proximal surface moderately and uniformly concave, of a vertically oval form, turned slightly inwards, and with the larger end terminating below in two tubercles : beyond these the phalanx suddenly diminishes in vertical thickness : the sides of the shaft are convex, the under part slightly concave : the distal articulation is a pulley of three surfaces ; the middle one concave, the two lateral strongly convex : the vertical extent of this trochlea is less than half that of the proximal articulation.

449. The middle phalanx of the adjoining toe, which corresponds with the third or middle toe in the pentadactyle foot.

The proportions of this phalanx differ much from those of the preceding bone ; its antero-posterior diameter exceeds by one-eighth part the vertical diameter, and by one-third part the transverse diameter. The depth of the phalanx rapidly contracts from the proximal end ; the sides are flattened, and slightly concave in the middle : they terminate anteriorly in the convex borders of the distal trochlea, which describe two-thirds of a circle ; the median depression of the pulley follows the same curve, and terminates both above and below in a wide and deep cavity. The proximal articulation consists of two vertical concavities separated by a median ridge, the upper extremity of which is more produced than the lower one ; but both combine to restrict the movements of the middle upon the proximal phalanx in the vertical direction, in which alone any motion is permitted by the form of the articular pulley.

450. The large unguis phalanx of the same toe.

The position of the trochlear cavity, which extends obliquely from above downwards and forwards over the base of the unguis phalanx, and the backward production of the upper end of the median trochlear ridge, causes this phalanx, in extreme extension, to have its long axis parallel with that of the middle phalanx: in extreme flexion the point of the claw is bent down at right angles to the middle phalanx. The lateral concavities receiving the trochlear convexities of the adjoining phalanx, and the median ridge fitting the median canal of the same, are so deep as to prevent any lateral motion, and give great strength to the joint. The upper production of the basal articulation of the unguis phalanx is flattened vertically, and rough; serving probably for the implantation of the extensor tendon. The osseous sheath of the claw is continued forwards from the upper margin of this surface; from the sides of the articular cavity, and of the flat rough oval surface at the proximal half of the base of the claw. The sheath, which varies from half a line to one line and a half in thickness, appears to have extended forwards over at least the basal third of the bony process supporting the claw: but it is broken away more or less in both the feet. The claw process, which forms the chief part of the unguis phalanx, is conical, slightly deflected, and inclined inwards; convex above and at the sides, which are divided from the under surface by a sharp edge: the under surface, owing to the oblique line from which the sides of the unguis sheath arise, is less than half the length of the upper surface: it is convex transversely along its middle part, concave on each side; these lateral channels bounded externally by the ridges above mentioned, and deepening as they approach the base of the phalanx. The vessels and nerves which supplied the secreting organ of the enormous claw were lodged in the above channels: of the two large oval perforations in the lower rough tract, the external one leads directly to the beginning of the corresponding channel, the internal one conducts to the cancellous structure of the phalanx. For the extent of one inch and a half from the apex of the claw, the upper surface is impressed with a shallow longitudinal channel.

451. The metatarsal bone of the fourth toe, the third in the *Mylodon*.
 452. The second phalanx, which is the terminal one, of the same toe.
 453. The metatarsal bone of the outermost, corresponding to the fifth toe.

The two outer metatarsal bones are the only ones of which the size and strength are proportionate to that of the principal bones of the tarsus, the calcaneum and astragalus. That which supports the fourth toe, counting as if the normal number had existed on the inner side of the foot, presents a short trihedral body, expanding into the two extremities. The proximal end is obliquely truncated on the tibial side, with the lower angle produced downwards. A smooth articular surface, slightly concave vertically, and slightly convex transversely, occupies this oblique base, and is divided by a moderate constriction into an anterior smaller ovate surface, adapted to the outer basal process of the middle metacarpal, and into a posterior, vertically elongated larger surface, applied to the tibial anterior facet of the *os cuboides*. A very slightly concave semi-elliptical articular surface extends obliquely upwards upon the outer side of the proximal end of the bone, and is adapted to a corresponding convex surface on the adjoining side of the fifth metatarsal. A shallow canal with many vascular perforations surrounds the margin of this surface; there is a rough tuberosity both above and below the surface. The outer or fibular side of the body of the present metatarsal is rugged and rather flattened: the remaining surfaces are smooth and convex. The distal end of the bone expands in the vertical direction, and supports a narrow, vertically elliptic, convex articular surface, surmounted by a large and rough tuberosity, and terminating below in concavities, placed somewhat obliquely, for two large sesamoid bones, separated by a short convex ridge. A narrow ridge traverses vertically the inner side of the distal end of the fourth metatarsal; and a smooth tuberosity rises from the middle of the outer side of the same extremity.

The metatarsal bone of the outer or fifth toe is of extraordinary size and strength; its length equals that of the adjoining toe; in the circumference of its base it surpasses the same bone by more than one-half. It presents the form of a rugged and irregular three-sided cone,

with an oblique base and an obtuse apex. The distal articular surface is of a triangular form, with the angles rounded off, and is divided into two parts; the larger portion being placed on the tibial half of the base of the bone, and applied to the outer facet of the anterior cuboidal articulation; the remaining portion encroaching upon the tibial side of the bone, and abutting upon the outer articular surface of the adjoining metatarsal. A slight concavity divides the basal articular surface from the large rough protuberance, by which the bone is prolonged backwards and outwards towards the os calcis. The strong tendon which traverses the outer groove of the calcaneum, was doubtless inserted and expanded over this protuberance, and the rough margin continued from it along the outer side of the metatarsal bone. The upper surface of the bone is concave, with small elevations and vascular foramina: near the distal end the elevations assume the size of, or blend into, a rough protuberance; the short inner side of the bone is convex; the under side concave, divided by a rough ridge from the inner side: the signs of the great pressure to which the outer rugged surface of this bone has been subject are too obvious to be mistaken; and the position of the articulation of the foot with the leg shows this to have been the surface which mainly transferred the superincumbent weight of the massive hinder parts of the *Myiodon* to the ground. The proximal articulations of the fifth metatarsal are so placed as to make it the key-stone or centre upon which almost the whole weight of the foot is concentrated. Thus the pressure sustained by the astragalus is transmitted in part by the naviculare, external cuneiform, and outer production of the base of the middle metatarsus upon the side of the fourth metatarsus which rests by the opposite side, in the usual inverted position of the foot upon the fifth metatarsal. Another part of the weight of the astragalus is transmitted by the cuboides, partly through the medium of the fourth upon the fifth metatarsal, partly directly to that bone. A third portion of the weight sustained by the astragalus is transmitted to the last metatarsal through the calcaneum and os cuboides. Sufficient need, therefore, for the surpassing strength and size of the fifth metatarsal, since it had to share with the calcaneum, but in a greater degree, in the support of the massive hinder parts of the

robust *Myloodon*. The osteology of this part of the skeleton of the *Myloodon* is replete with interest to the physiologist and student of animal mechanics: the tarsal portion of the foot is a perfect specimen of massive organic masonry. The analogical correspondenee which may be traced between the hind and fore-foot is very close; since it is evident that the two curtailed outer toes, whose extremities seem, as it were, to have suffered amputation, were sunk in a hoof-like modification of the integument of that part of the foot.

454. The left astragalus of the *Myloodon robustus*.
455. A portion of the right external euneiform bone of the *Myloodon robustus*.
456. A flattened ossicle, without any articular surface, with the margins rounded, and the two sides with a striated or fibrous character: this may either have been a dermal bone, imbedded in the substance of the corium, or it may have been developed in a tendon like the palmar and plantar sesamoid ossicles in the Armadillos: it does not resemble either of those ossicles in shape. This and the three following specimens were exhumed with the bones of the skeleton of the *Myloodon robustus*, to which they most probably belong.
457. A similar ossicle, apparently the analogue of the opposite side, and forming with the preceding bone a symmetrical pair.
458. A similar, but smaller ossicle, and of a different shape from either of the preceding.
459. A similar, but larger ossicle.
460. The left squamo-temporal bone of a foetal or newly-born *Myloodon robustus*. The air-cells have not begun to be developed in the diploë of this bone.
461. The left os petrosum of the same foetal or immature animal.
462. A portion of the left parietal bone of the same foetal or immature animal. The broad sutural surface, which unites with the squamo-temporal, exhibits a more complicated junction of the two bones than is

usual in quadrupeds. The temporal overlaps the parietal posteriorly, but is overlapped for an equal extent by the parietal at the anterior part of the squamous suture.

463. A portion of the supra-occipital plate or bone of the same foetal or immature animal.

464. The right ex-occipital bone of the same foetal or immature animal.

465. The left ex-occipital bone of the same foetal or immature animal.

The foregoing portions of an apparently foetal cranium were exhumed with the bones of the articulated skeleton of the *Myiodon robustus*, and, since the form of the pelvis appears to indicate that it belonged to the female sex, it is probable, from the analogy of the Sloth which produces one large foetus at a birth, that it may have been pregnant at the time of its death.

Purchased.

466. A fragment of the scapula of a young *Myiodon robustus*, including the glenoid articulation.

467. A larger portion of the opposite scapula, including the spinous process.

From the Pampas of Buenos Ayres.

Purchased.

468. The proximal extremity of the left ulna of a young *Myiodon robustus*.

From the Pampas of Buenos Ayres.

Purchased.

469. Portions of the ex-occipital bones, including the condyles, and the large anterior condyloid foramina of a young *Myiodon robustus*.

From the Pampas of Buenos Ayres.

Purchased.

470. The left half of the cranium of a Megatherioid animal, probably the *Myiodon Darwinii*.

471. The tympanic bone of the same cranium.

These specimens were originally described under the name of the *Glossotherium**, but their close correspondence with the entire cranium of the *Myiodon robustus*, subsequently discovered, renders it most probable

* Zoology of the Voyage of the Beagle, Fossil Mammalia, 4to, 1839, p. 57.

that they appertain to a species of the same genus. The portion of the cranium includes the parietals of the left side of the cerebral cavity, the corresponding nervous and vascular foramina, the left occipital condyle, a portion of the left zygomatic process, and fortunately also the left articular surface for the lower jaw. The condyles of the occiput are wide apart, sub-elliptic, very similar in position, form and relative size to those in *Orycteropus*. The foramen occipitale is transversely oval; its plane slopes from above downwards and forwards at an angle of 40° with that of the occipital region of the skull. The occipital plane is bisected by a mesial vertical ridge: there is a less developed transverse curved intermuscular crest, which runs parallel with and about half an inch below the marginal ridge; the surface of the occipital plane on the interspaces of these ridges is irregularly fitted with the impressions of the insertion of powerful muscles. The upper surface of the cranium is smooth and regularly convex.

The extent of the origin of the temporal muscles is defined by a slightly raised broad commencement of a ridge. The zygomatic process of the temporal commences posteriorly about an inch and a half from the occipital plane: its origin or base is extended forwards in a horizontal line fully four inches, where it terminates as usual in a thin concave edge. The free portion of the zygoma, continued forwards from the outer part of this edge, is a slender sub-compressed process, half an inch in the longest or vertical diameter, and less than three lines in the transverse; the extremity of this process is broken off: the opposite extremity of the molar portion of the zygoma is entire and obtusely rounded. The articular surface beneath the zygoma for the lower jaw is flat and even, with the outer and inner margin slightly bent down, but having no definable anterior or posterior limits; its breadth is two inches.

The loose bony frame of the membrana tympani describes rather more than a semicircle, having the horns directed upwards: it has a groove, one line in breadth, along its concave margin for the attachment of the membrane, and sends down a rugged process, half an inch long, from its lower margin. The tympanic bone in the existing Sloths long maintains a similar detached condition as a bony hoop. In the *Dasypodes* and

Myrmecophaga the tympanic bone soon becomes ankylosed with the other parts of the temporal: it is only in *Orycteropus*, among the existing insectivorous Bruta or Edentata, that it manifests throughout life the foetal condition of a distinct bony hoop, deficient at the upper part. The os tympanicum of *Orycteropus*, however, differs from that of the fossil in forming part of the circumference of an ellipse, whose long axis is vertical; and in sending outwards from its anterior part a convex eminence, which terminates in a point directed downwards and forwards.

The internal surface of the present cranial fragment affords a very satisfactory idea of the size and shape of the brain of the extinct species to which it belonged. It is evident that, as in other Bruta, the cerebellum must have been almost entirely exposed behind the cerebrum; and that the latter was of small relative size, not exceeding that of the Ass; and chiefly remarkable, as in the Oryctrope, Ant-eater and Armadillo, for the great development of the olfactory ganglia. The antero-posterior extent of the cribriform plate, as exposed in this fragment, is three inches, and the complication of the ethmoid olfactory lamellæ, which radiate from it into the nasal cavity is equal to that which exists in the smaller Edentata. The nasal cavity is complicated by the great number and capacious size of the air-cells which are in communication with it: these extend over all the upper, lateral and back parts of the cranial cavity, as far even as the upper boundary of the foramen magnum; they also occupy the anterior two-thirds of the basis cranii. The external configuration of the skull would therefore afford a very inadequate or rather deceptive notion of the capacity of the cerebral cavity, were not the existence and magnitude of these sinuses known. The interspace of the outer and inner tables of the cranium are separated above the origins of the olfactory ganglia for the extent of three inches: above the middle of the cerebrum they are an inch and a half apart; at the sides of the cranium the interposed air-cells are from one to two inches across; at the back part of the cranium about one inch. The sinuses have generally a rounded form. In this remarkable structure the present fossil corresponds with the skull of the *Mylodon robustus*.

The foramen rotundum and the foramen ovale are situated close together, within a common transversely oblong depression. The carotid canal opens into the outer side of the commencement of this wide channel, which conducts the great fifth pair of nerves to the outlets of its two chief divisions. The petrous bone projects into the cranial cavity in the form of an angular process with three faeets: the foramen auditorium internum and the aqueductus vestibuli, are situated on the posterior faeet. Immediately behind the os petrosum is the foramen laecrum jugulare, situated at the point of convergenec of the vertical groove of the lateral sinus with a groove of similar size continued forwards from above the anterior condyloid canal. The plane of the internal opening of this canal is directed obliquely inwards and backwards, and the lateral wall of the foramen magnum behind the foramen condyloideum slopes outwards to the edge of the condyle. Immediately internal to the foramen condyloideum is a small vaseular foramen conducting a branch of the basilar artery into the condyloid canal, for the nourishment doubtless of the great lingual nerve.

There is a remarkable cavity situated immediately behind the tympanic bone of nearly a regular hemispherical form, an inch in diameter. The superficies of this cavity appears not to have been covered with articular cartilage, for it is irregularly pitted with many deep depressions, and probably afforded a ligamentous attachment to the styloid element of a large os hyoides. With this indication of the size of the skeleton of the tongue, is combined a more certain proof of the extent of its soft and especially its museular parts, in the magnitude of the foramen, for the passage of the lingual or motor nerve. This foramen (the anterior condyloid) in the present specimen is the largest of those which perforate the walls of the eranium, with the exeption of the foramen magnum: it is fully twice the size of that which gives passage to the second division of the fifth nerve; its area is oval, and eight lines in the long diameter, so that it readily admits the passage of a man's little finger.

Some idea of the size of the lingual nerve and of the organ it was destined to put in motion, may be formed, when it is stated that the foramen giving passage to the corresponding nerve in the Giraffe—the

largest of the Ruminants, and having the longest and most muscular tongue in that order—is scarcely more than one-fourth the size.

Immediately internal to the glenoid cavity is the large orifice of the canal transmitting the third division of the fifth pair of nerves, the principal branch of which endows the tongue with sensibility: this foramen is rather less than that for the muscular nerve of the tongue*.

Discovered in a tertiary stratum forming the bed of a river in Banda Oriental, South America, and

Presented by Charles Darwin, Esq., F.R.S.

472. The lower jaw of the *Mylodon Darwinii*.

The symphysis of this jaw, as in that of the *Myl. robustus*, is completely ankylosed, about four inches in length, and extended forwards to the extremity of the jaw at a very slight angle with the inferior border of the ramus; it is of great breadth, smooth and gently concave internally, and equally suggests the idea of its adaptation for the support and gliding movements forwards and backwards of the free extremity of a long and well-developed tongue. The exterior surface of the symphysis is characterised by the presence of two oval mammilloid processes, situated on each side of the middle line, and about half-way between the anterior and posterior margins of the symphysis. Nearly four inches behind the anterior extremity of the above process is the large anterior opening of the dental canal: it is five lines in diameter, situated about one-third of the depth of the ramus of the jaw from the upper margin. The magnitude of this foramen, which gives passage to the nerve and artery of the lower lip, indicates that this part was of large size; and the two symphyseal processes, which probably were subservient to the attachment of large retractor muscles, denote the free and extensive motions of such a lip as we have presumed to have existed from the size of the foramina destined for the transmission of its nerves and nutrient organs.

The angle of the jaw is produced backwards, and ends in an obtuse point slightly bent upwards: a foramen, one-third less than the anterior one, leads from near the commencement of the dental canal, to the outer

* For the relation of so large a tongue to the probable habits of the *Mylodon*, see the Memoir on the *Myl. robustus*, p. 154.

surface of the jaw, a little below and behind the last molar tooth : this foramen presents the same size and relative position on both sides of the jaw.

The base of the coronoid process begins external and posterior to the last grinder : the whole of the ascending ramus of the jaw beneath the coronoid process is excavated on its inner side by a wide and deep concavity, bounded below by a well-marked ridge, which extends obliquely backwards from the posterior part of the alveolus of the last grinder to the inferior margin of the ascending ramus, which is bent inwards before it reaches the angle of the jaw.

The large foramen or entry to the dental canal is situated in the internal concavity of the ascending ramus of the jaw, two inches behind the last molar, three inches from the lower margin of the ramus, and nearly five inches from the elevated angle of the jaw : it measures nine lines in the vertical diameter, and its magnitude indicates the large size of the vessels which were destined to supply the materials for the constant renewal of the dental substances, which from their texture must be supposed to have been rapidly abraded. About an inch behind the dental foramen a deep muscular groove, about two lines in breadth, is continued downwards to the ridge which circumscribes the internal concavity of this part of the jaw, and perforates the ridge, which thus arches over the canal : this structure is present in both rami of the jaw.

The mylo-hyoid ridge is distinctly marked about an inch and a half below the alveolar margin. Other muscular ridges and irregular eminences are present on the outer side of the base of the ascending ramus and near the angle of the jaw.

In the *Myiodon Darwinii* the rami of the lower jaw are relatively longer than in the *Myiodon robustus*, especially anterior to the molar series, where they become more contracted vertically, and converge to a narrower and longer symphysis. The posterior angular process is relatively shorter and more bent upwards. The molar teeth project further from their sockets in the specimen compared than they do in the *Myiodon robustus*. The anterior outlet of the dental canal is single, and it is more in advance of the first alveolus. The symphysis is not only

longer, but is inclined forwards at a more open angle with the horizontal ramus: the two tuberosities on the outside of the symphysis for the attachment of the retractors of the lower lip, are much more strongly developed in the *Myiodon Darwinii* than in the *Myiodon robustus*.

From the cliffs at Bahia Blanca, near Patagonia.

Presented by Charles Darwin, Esq., F.R.S.

473. A section of a portion of the left ramus of the lower jaw of the *Myiodon Darwinii*, showing the forms of the transverse sections of the teeth and the depth of their implantation in the alveoli. The outer part of the hard dentine is black, as if carbonized or charred; the rest of the tooth retains its light colour. The first molar in the present jaw is the smallest and simplest of the series: its transverse section is ellipsoid or subovate, narrowest in front, and somewhat more convex on the outer than on the inner side. The second tooth presents in transverse section a more irregular and wider oval figure than the first; the line of the outer side is convex, but that of the inner side is slightly concave in consequence of the tooth being traversed longitudinally by a broad and shallow channel or impression.

From the cliffs at Bahia Blanca, near Patagonia.

Presented by Charles Darwin, Esq., F.R.S.

474. A transverse section of the third molar tooth, left side, lower jaw.

The transverse section of this tooth has a trapezoidal or rhomboidal form: the angles are rounded off: the posterior one is most produced: the anterior and posterior surfaces are flattened, the latter slightly concave in the middle: the external and internal sides are concave in the middle, especially the inner side, where the concavity approaches to the form of an entering notch.

From the cliffs at Bahia Blanca, near Patagonia.

Presented by Charles Darwin, Esq., F.R.S.

475. A transverse section of the fourth and last molar tooth, left side, lower jaw.

The last molar, which is generally the most characteristic in the fossil Bruta, presents in an exaggerated degree the peculiarities of the preceding tooth: the longitudinal channels on both the outer and

inner surfaces encroach so far upon the substance of the tooth, that the central coarse or vascular dentine is, as it were, squeezed out of the interspace, and the elevated ridge of the dense ivory describes an hour-glass figure upon the triturating surface, the connecting isthmus being but half the breadth of the rest of the tract: the external cement preserves nearly an equal thickness throughout. Of the two lobes into which this tooth is divided by the transverse constriction the anterior is the largest; their proportions and oblique position are pretty accurately given in the figure.

From the cliffs at Bahia Blanca, near Patagonia.

Presented by Charles Darwin, Esq., F.R.S.

476. The third molar tooth, left side, lower jaw, of the *Mylodon Harlani*.

Purchased.

477. A portion of the atlas of a *Mylodon*, probably *Myl. Darwinii*: the transverse processes are wanting; the canal for the second pair of spinal nerves is converted into a foramen by a bridge of bone connecting the posterior margin of the neural arch with the posterior oblique process.

From the tertiary deposits of the Pampas of Buenos Ayres.

Purchased.

478. The body and one of the cornua majora of the os hyoides of a Megatherioid animal equal to the *Mylodon* in size; probably the *Mylodon Darwinii*.

From the tertiary deposits of the Pampas of Buenos Ayres.

Purchased.

479. The cerato-hyal bone of, probably, the *Mylodon Darwinii*.

From the tertiary deposits of the Pampas of Buenos Ayres.

Purchased.

480. The smaller or hyoid moiety of the stylo-hyal bone of, probably, the same animal.

From the tertiary deposits of the Pampas of Buenos Ayres.

Purchased.

481. The manubrium sterni of a *Mylodon*, probably *Myl. Darwinii*.

The two anterior lateral margins are thinner and slightly concave;

the clavicular ligaments were doubtless attached to these and to the contiguous concavities. The two posterior lateral margins present a narrow elongated slightly sinuous articular surface for the first sternal rib, and, below this, a concavity forming the contracted posterior part of the manubrium. The posterior boundary of the manubrium supports five articular surfaces; two on each side for the bifid, thickened, articular ends of the second sternal ribs; and the intermediate part by which it is joined to the second bone, or the first of the series constituting the body of the sternum.

From the tertiary deposits of the Pampas of Buenos Ayres.

Purchased.

482. The sternal ends of the first pair of ribs, which were connected with the preceding manubrium sterni.

The first rib increases in breadth as it approaches the sternum; rough prominences on its outer surface indicate where the ossified cartilage originally began; this, which in its present ossified and anchylosed state forms the sternal end of the rib, was of a quadrate figure, broader than long. It was articulated by a synovial surface of a narrow oval form to the manubrium sterni.

Purchased.

483. The shaft and distal extremity of the humerus of a *Mylodon*, partly imbedded in a mass of coarse limestone: the form of the distal articular surface corresponds with that in the *Mylodon robustus*. The specimen is from the same stratum and locality as the lower jaw of the *Mylodon Darwinii*, viz. Bahia Blanca, near Patagonia.

Presented by Charles Darwin, Esq., F.R.S.

484. The head of the left femur, in the state of an epiphysis of the *Mylodon Darwinii*.

From the cliffs at Bahia Blanca.

Presented by Charles Darwin, Esq., F.R.S.

485. The internal condyle of apparently the same femur of the *Mylodon Darwinii*.

From the cliffs at Bahia Blanca.

Presented by Charles Darwin, Esq., F.R.S.

Genus *Scelidotherium*.

The following specimens belong to the same skeleton of the *Scelidotherium leptocephalum*. They were discovered in the cliffs at Bahia Blanca, and were

Presented by Charles Darwin, Esq., F.R.S.

486. The skull and right stylo-hyal bone.

The brain being regulated in its development by laws analogous to those which govern the early perfection of the organ of hearing, appears, from the obvious immaturity of the present specimen, to have been relatively larger in the *Scelidotherium* than in the *Myiodon*: it was certainly relatively longer: the fractured cranium gives six inches of the antero-posterior diameter of the brain, but the analogy of the *Myiodon* would lead to the inference that it extended further into the part which is broken away. The greatest transverse diameter of the cranial cavity is four inches eight lines: these dimensions, however, are sufficient to show that the brain was of very small relative size in the *Scelidotherium*; and, both in this respect and in the relative position of its principal masses, the brain of the extinct *Megatherioid* closely accords with the general character of this organ in the existing species of the same Order.

We perceive by the obtuse ridge continued obliquely upwards from above the upper edge of the petrous bone, that the cerebellum has been situated wholly behind the cerebrum: we learn also from the same structure of the enduring parts that these perishable masses were not divided, as in the *Manis*, by a bony septum, but by a membranous tentorium, as in the *Myiodon* and Sloths: in the *Orycteropus* there is a strong sharp bony ridge extending into each side of the tentorium. The vertical diameter of the cerebellum and medulla oblongata equals that of the cerebrum, and is two inches three lines; its antero-posterior extent about one inch and a half. The sculpturing of the internal surface of the cranial cavity bespeaks the high vascularity of the soft parts which it contained, and there are evident indications that the upper and lateral surfaces of the

brain had been disposed in a few simple parallel longitudinal convolutions.

The lower jaw resembles, in the general form of the posterior moiety which is here preserved, that of the Sloth and Mylodon more than that of any other edentate species. Its deep posterior angle is produced backwards, and a broad coronoid process rises and nearly fills the zygomatic space ; the condyle is flat, as the glenoid surface has already indicated ; its transverse diameter is an inch and eight lines : its antero-posterior diameter seven lines : it is principally extended inwards beyond the vertical line of the ascending ramus. The lower contour of the jaw describes an undulating line, which, commencing from the posterior angle, is at first gently convex, then slightly concave, then again convex below the alveoli of the teeth, where it is rounded and expanded as in the *Orycterope*.

The fractured condition of the right ramus of this part fortunately exposed the roots of the four grinding teeth, which constitute the dental series on each side of the lower jaw. The length of the jaw occupied by these four alveoli is three inches ten lines, which exceeds a little that of the opposed five grinders above ; the ramus of the jaw gradually diminishes in all its dimensions anterior to the molar teeth ; the dental canal passes in a gentle curve below and on the inner side of the alveoli, whence it gradually inclines to the outer wall of the jaw.

The whole ascending ramus of the jaw consists of a very thin plate of bone : it is slightly concave on the inner side, and the inferior margin of the produced angle inclines inwards as in the *Mylodon* and *Sloth* : it is impressed on the outer side with two shallow depressions, and two parallel ridges, both following the gentle curvature of the part. There is a foramen on the outer side of the ramus at the anterior part of the base of the coronoid process corresponding with that in the lower jaw of the *Mylodon*, but the longitudinal channel which runs along the outer side of the alveolar process is wanting, and the expansion at the base of those processes is more sudden and relatively greater : the general correspondence, however, between these lower jaws is such as would lead

to the idea that they belonged to animals of the same genus, were it not that the teeth present modifications of form in the *Scelidotherium*, as distinct from those of the *Mylodon* as are any of the minor dental differences on which genera or subgenera of existing Mammalia are founded in the present state of zoological classification.

487. An upper molar tooth of the *Scelidotherium leptcephalum*.

488. A section removed from the right ramus of the lower jaw of the *Scelidotherium leptcephalum*, showing the forms of the four molar teeth in transverse section.

The first molar is not divided by a disproportionate interspace from the rest: its transverse section gives a narrow inequilateral triangle, with rounded angles, and the base turned inwards and obliquely forwards. The second molar also, instead of an elliptical transverse section, presents a triangular one with the angles rounded off, and two of the sides slightly indented; it resembles the antepenultimate molar in the *Mylodon robustus*. The third and fourth molars of the *Scelidotherium* are more compressed than in the *Mylodon*; the bony axis of their transverse section is from before backwards, instead of transversely. The fifth molar has a trihedral form, with the broadest side turned outwards and slightly indented.

In the lower jaw of the *Scelidotherium* the differences in the form of the teeth from those in the *Megatherium*, *Megalonyx* and *Mylodon*, are equally manifest, especially in the prismatic form of the first molar: the last molar resembles that of the *Mylodon Darwinii*; the grinding surface of this tooth being divided into two lobes by two oblique channels which traverse longitudinally, one the outer, the other the inner side of the tooth: but these are shallower than in the *Mylodon Darwinii*, and the lobes are more equal and more flattened. The two middle teeth differ more markedly from the corresponding ones in any of the species of *Mylodon*: the transverse section of both these teeth presents, in the *Scelidotherium*, a compressed oval form, with the large end turned obliquely forwards towards the outer side of the jaw, and slightly indented, whilst

the inner and narrower end of the section is convex. The first lower molar in the *Scelidothera* corresponds in form with the first upper molar, and is consequently easily distinguishable from the corresponding tooth in the genus *Myiodon*.

489. The cervical vertebræ.

The cervical vertebræ present the ordinary mammalian number, seven, and are free or so articulated as to permit of reciprocal movement upon each other. Their transverse processes are perforated as usual for the vertebral arteries. These processes in the atlas are remarkable for their great breadth, length and thickness; and indicate that the muscular force which must have worked the head upon the spine was very powerful. The axis is provided with a robust "processus dentatus," having a base equal in breadth to the body of the axis itself, and a smooth articular convexity on the side of the apex on which the ring of the atlas rotated. The line of union between the axis and its characteristic process, which here resembles the body of an abortive vertebra, is very distinct. The transverse processes of the vertebra dentata are comparatively feeble, but this condition is amply compensated for by the great development of the spinous process. This process is bent backwards at nearly a right angle, overlaps with its reflected extremity the spine of the third cervical vertebra, and rests by its base, on the under part of which are the posterior articular surfaces, upon the broad and strong anterior oblique processes of the third vertebra. The third, fourth, fifth and sixth cervical vertebræ have moderately developed and pointed spinous processes; their transverse processes are broad, and extend obliquely backwards and slightly overlap each other. On the under part of the transverse process of the sixth cervical vertebra there is the fractured base of what I conjecture to have been an expanded aliform plate, analogous to that observable in the corresponding vertebra of the *Orycterope*. The seventh cervical vertebra has part of the articular depression for the head of the first rib upon each side of its body: the transverse process is feebly developed, but the spine is double the height and size of those of the preceding vertebræ.

490. Seven of the dorsal vertebræ.

The spinous process of the first dorsal vertebra rises to twice the height of the preceding spine of the seventh cervical, and preserves an equal antero-posterior diameter from its base to its summit, which is thick and slightly bent backwards: four or five succeeding dorsal vertebræ give evidence of having been surmounted by spines of equal height and strength.

The fragments of the dorsal vertebræ and ribs of the *Scelidotherium* closely conform, excepting in the greater relative height of the anterior dorsal spines, with the *Megatherioid* type.

491. The three lumbar vertebræ, which are not ankylosed to each other, or to the sacrum, as in the *Mylodon robustus*.492. The sacrum. This complete bone manifests in its great expansion posteriorly, where it joins the ischium, in the capacious medullary cavity and wide nervous foramina, a like conformity with the *Megatherium* which is presented by the pelvis of the *Mylodon*, and a corresponding harmony with the disproportionate bulk of the hind-legs.

493. Portions of several of the vertebral ribs.

494. The right scapula.

495. The humeral half of the left scapula.

The scapula of the *Scelidotherium* in its double spine, in the osseous arch formed by the confluence of the acromion with the coracoid process, and in the substitution of a distinct foramen for the suprascapular notch, agrees with that of the *Megatherium*: but the span of the acromial arch is relatively wider, and the surface for the articulation of the clavicle is better marked. The limits of the acromial and coronoid portions of the arch are still definable in the present skeleton, indicating, with the unankylosed condition of most of the epiphyses, the nonage of the individual.

496. The proximal portion of the left humerus cemented to the foregoing scapula by the calcareous matrix.

497. The left humerus. This bone presents a large convex oval head, on each side of which is a tuberosity for the implantation of the supra- and subscapular muscles : these tuberosities do not rise above the articular convexity so as to restrict the movements of the shoulder-joint, as in the Solipedia and Ruminantia, but exhibit a structure and disposition conformable to those which characterize the proximal extremity of the humerus in the Mylodon, and those Mammalia which enjoy rotatory and lateral movements of the fore-limb. The tuberosities are, however, relatively more developed and give greater breadth to the proximal end of the humerus in the Scelidothere than in the Megathere.

The distal end of the humerus although mutilated clearly indicates that it had the same characteristic breadth of the external and internal condyles as in the Megatherium. The left condyle was perforated for the direct passage of the artery or median nerve, or of both, to the fore-arm. The groove for the musculo-spiral nerve on the outer side of the humerus is overarched at its upper part by a strong obtuse process ; which is comparatively less developed in the Megatherium. The trochlea or inferior articular surface of the humerus supports, as in the Megatherium, two well-marked convexities with an intervening concavity ; this indication of the rotatory power of the fore-leg is confirmed by the form of the head of the radius.

498. The left ulna.

499. The left radius. These bones of the *Scelidotherium leptcephalum* are cemented together by the calcareous matrix of the stratum in which almost the entire skeleton of the same individual was found.

The relative length of the fore and hind extremities cannot be precisely determined from the present imperfect skeleton of the Scelidothere ; but there is good evidence for believing that the fore extremity was the shortest.

The humerus is shorter than the femur by one-ninth part of the latter bone ; and the radius, which wants only the distal epiphysis, must have been shorter than the humerus. In the Scelidotherium the general proportions of the radius much more nearly approach those of the Mylodon,

but the proximal articular cavity is subcircular, as in the *Megatherium* and *Megalonyx*.

The distal half of the outer margin of the radius is convex; the bicapital tuberosity is nearer the proximal end and nearer the inner margin of the bone; the posterior surface of the radius more resembles that in the *Megalonyx*. Like the perforated humerus, the present bone in the *Scelidotherc* also exhibits modifications which connect the *Myloodon* with the *Megalonyx*.

500. The right femur, wanting the distal extremity; its fractured end demonstrates the absence of the medullary cavity.
501. The left femur. This is a very remarkable bone, both on account of its great proportional size as compared with the body, and its extreme breadth as compared with its length or thickness; but in all these circumstances the affinity of the *Scelidotherc* with the *Megatherc* is prominently brought into view. The breadth of the femur, though considerable, is less marked in the *Myloodon*; and there are no other known quadrupeds with which the *Scelidotherc* can be compared in this respect. In proceeding, however, to compare together the thigh-bones of the *Scelidotherc* and *Megatherc*, several differences present themselves which are worthy of notice: of these the first is the presence in the *Scelidotherc* of a depression for a ligamentum teres on the back part of the head of the femur, near its junction with the neck of the bone.

The head itself forms a pretty regular hemisphere: the great trochanter does not rise so high as in the *Megatherc*, but relatively it equals it in its breadth. The small trochanter is proportionally more developed; the external contour of the shaft of the femur is straighter in the *Scelidotherc* than in the *Megatherc*, and the shaft itself is less bowed forwards at that part. The articular condyles occupy a relatively smaller space upon the distal extremity of the femur in the *Scelidotherc*, and they differ more strikingly from those of the *Megatherc* in being continued one into the other: the rotator surface, for example, is formed by both condyles, while in the *Megatherium* it is a continuation exclusively of the external articular surface on the outer condyle.

502. The proximal extremity of the left tibia and the left patella, cemented together by the calcareous matrix.

Of the long bones of the leg only this end of the tibia is preserved; but it is valuable as showing another well-marked difference between the *Scelidothera* and *Megatherium*; for whereas in the latter the fibula is ankylosed with the tibia, this bone in the *Scelidothera* presents a smooth, flat, oval, articular surface below the outer part of the head; from the size and appearance of which I infer that the fibula would not have become confluent with the tibia even in the mature and full-grown animal, but would have remained separate as in the *Mylodon*.

The patella is a thick, strong, oval bone, with the smaller end downwards, rough and convex externally, smooth on the internal surface, which is concave in the vertical and convex in the transverse directions.

503. The right astragalus, cemented by the calcareous matrix to the head of the femur.

504. The left astragalus.

The upper articular surface of this characteristic bone presents two convex pulleys with an intermediate concavity: the outer or fibular trochlea, though higher than the inner one, is much less elevated than in the *Megatherium*, and contracts to a ridge anteriorly. The anterior part of the astragalus of the *Mylodon* which forms the articular surface for the os naviculare, presents one convex and two concave facets, the outer one receiving part of the os cuboides. In the *Megatherium* the corresponding part of the astragalus presents one convex and one concave surface, the latter corresponding with the upper and inner concave surface in the *Scelidothera*. In the *Mylodon* the part corresponding to the latter concavity is flat. On the under surface of the astragalus the articulation for the os calcis is divided from that for the naviculare by a deep rough groove, as in the *Megatherium*, but the two surfaces are continuous in the *Mylodon robustus*.

505. The unguis phalanx of the longest or middle digit of the hind-foot.

The articular pulley of this bone slopes towards the under surface and

is overtopped by an obtuse protuberance, impeding any upward retraction of the claw, and well-illustrating the argument by which Cuvier established the true affinities of the allied genus *Megalonyx*. The present phalanx is, however, less compressed and less incurved than in that genus. The osseous sheath for the claw is developed only at the under part of the bone, where it presents the form of a thick flat plate, with the margin obliquely bevelled off, and with a vertical ridge of bone attached lengthwise to the middle of its under surface. This process doubtless served for the insertion of a very powerful flexor tendon.

Megatherioid Fossils.

506. The body of a vertebra, probably the last cervical, of a Megatherioid animal; it exhibits the great width of the spinal canal which characterizes this extinct family of Edentate quadrupeds, and presents two tuberosities, one on each side of the posterior^{*} part of the lower surface.

From South America. *Presented by Charles Darwin, Esq., F.R.S.*

507. A dorsal vertebra of a large Megatherioid quadruped, which well displays the characteristic capacity of the spinal canal, and the third posterior articular process situated in the interspace of the two normal processes.

From the tertiary deposits of Buenos Ayres. *Purchased.*

508. The body of a dorsal vertebra of the same species of Megatherioid animal.

From the same stratum and locality. *Purchased.*

509. The inferior bony arch of a caudal vertebra of a *Myloodon* or *Megalonyx*; it is formed by the distal confluence of the two hæmapophysial elements, each of which upon its proximal end or base supports two distinct articular surfaces.

From the tertiary deposits at Buenos Ayres. *Purchased.*

510. The body and anchylosed posterior crura of the hyoid bone of probably a Megatherioid animal, as large as the *Myloodon*; it differs from the corresponding parts of the hyoidean apparatus in the *Myloodon robustus*, in

having the cornua shorter, straighter, more prismatic, and the sides flatter and meeting at sharper edges, especially at the upper part: the articular surfaces for the thyroid cornua are at the posterior instead of the under surface of the expanded end of the cornua. The articular surfaces for the anterior cornua are upon the anterior part of the angles of the body, not raised upon tuberosities: the ceratohyals were perhaps articulated by the intervention of a short bony piece, which, anchylosed to the body in the *Mylodon*, may give rise to the characteristic tubercles of the bone in that genus. The body of the hyoid, in the present specimen, presents two convex ridges below the articular surfaces, and is flattened and slightly expanded at the under part.

From the tertiary deposits at Buenos Ayres. *Purchased.*

511. The left stylo-hyal bone of a large Megatherioid quadruped.

From the tertiary deposits of Buenos Ayres. *Purchased.*

512. The sternal extremities of the two clavicles of a *Mylodon* or of a *Megalonyx*.

From the tertiary deposits of Buenos Ayres. *Purchased.*

513. The distal half of the right femur of a Megatherioid animal of the size of the *Mylodon* or *Megalonyx*; it resembles the same bone of the *Mylodon* in its great breadth and antero-posterior compression, but differs in being excavated by a medullary cavity, and in having the rotular articular surface distinct from those of the two condyles: in the latter structure it resembles the *Megalonyx*, but differs from the *Megalonyx Jeffersoni* in the general form of the articular surface.

From the tertiary deposits of Buenos Ayres. *Purchased.*

514. The right astragalus of a Megatherioid quadruped, somewhat larger than the *Mylodon robustus*: it resembles the astragalus of the *Mylodon* in the flattening of the upper half of the navicular surface, but differs in having the calcaneal surface divided into two parts by a deep rough groove, in which character it resembles the *Megatherium*.

From the tertiary deposits of Buenos Ayres. *Purchased.*

515. The tibia, in longitudinal section, of the *Mylodon Darwinii*: it is longer in proportion to its breadth than in the *Mylodon Harlani*, the articular cavity for the inner condyle of the femur has a wider oval figure; the outer margin of the shaft of the bone is thicker and more rounded than in either the *Myl. Harlani* or *Myl. robustus*. The section shows the absence of a medullary cavity, as in the tibia of the recent Sloths: a close but rather coarse cancellous texture extends uninterruptedly from the line of the proximal to that of the distal epiphysis: the compact outer wall is two-thirds of an inch thick at the anterior part of the middle of the shaft, and about half that thickness at the posterior part; it rapidly decreases in thickness from the middle towards the extremities of the bone.

Tribe *Loricata*.

Genus *Glyptodon*.

Those specimens of the present genus, which were presented to the College by Sir Woodbine Parish, are from a low marshy place, about five feet below the surface, in the bank of a rivulet, near the Rio Matanza, in the Partido of Canuelas, about twenty miles to the south of the city of Buenos Ayres.

516. A molar tooth, with the basal portion broken away, of the gigantic club-footed Armadillo (*Glyptodon clavipes*, OWEN).

The whole length of the portion of tooth, which gives the generic character of this extinct member of the loricated or Armadillo tribe, is two inches and a quarter, and there is no indication of a diminution in any of its diameters, from the grinding surface to the opposite fractured end: in this respect the present tooth agrees with the form of the sockets in the fragment of the jaw next to be described, which sockets terminate abruptly without any contraction, and indicate by their depth that the length of the present tooth, when entire, was about four inches; the antero-posterior diameter of the tooth is one inch; the transverse diameter varies from six to seven lines. The three sockets in the fragment of the jaw give the same general proportions, though

they vary a little as to size, showing that the teeth of the Glyptodon are much more compressed than those of the Megatherium; but the teeth differ more materially in their intimate structure, which corresponds with that of the teeth of the existing Armadillos. The main constituent of the tooth, or the dentine, consists of fine calcigerous tubuli, radiating with a pretty straight course from the medullary cavity; the dentine is surrounded by a very thin layer of cementum; and the pulp-cavity, at the upper part of the tooth, is consolidated by the ossified remains of the pulp, which is harder than the surrounding dentine, and forms a projecting ridge on the grinding surface. The teeth of the Glyptodon, however, differ in a marked degree from those of all the known species of Armadillo, in being traversed, through the whole length of both their outer and inner sides, by two broad and deep angular grooves, each extending from the opposite sides about one-third across the transverse diameter of the tooth, so as to divide the grinding surface into three portions, joined together by the contracted isthmus interposed between the opposite grooves. Of these portions the posterior one is broader than the other two. The sockets present longitudinal angular ridges, corresponding to these channels or flutings*, and prove that they were continued through the whole length of the tooth; this is slightly curved, and the concavity is turned inwards in the teeth of the lower jaw, as in the Toxodon.

Presented by Sir Woodbine Parish, K.H.

517. A fragment of the anterior part of the left ramus of the lower jaw, including portions of the sockets of the four anterior teeth; the first is small and simple, and is situated close to the anterior termination of the

* The generic name of the present extinct South American quadruped relates to the fluted sculpturing of the tooth, γλίφω, *sculpo*, ὀδὸν, *dens*.

Since this name was proposed in Sir Woodbine Parish's account of Buenos Ayres, and in the Proceedings of the Geological Society for March 1839, the discovery of bones and armour of the *Glyptodon*, under the name of *Hoplophorus*, by M. Lund, in the caverns of the valley of the Rio des Velhas, Brazil, has been announced in a letter from that gentleman to M. Audouin, published in the Comptes Rendus, Avril 15th, 1839. Prof. D'Alton of Halle subsequently brought the subject of the *Glyptodon* before the Meeting of the German Physicians and Naturalists at Erlangen, September 1839, and has proposed for it the name of *Pachypus*.

dental canal: the second socket shows, by the two prominent vertical ridges on its anterior and posterior walls, that the tooth which it contained had the fluted form characteristic of the genus: the third socket, which is the most complete, differs from the preceding in a slight increase of size, and it shows that the tooth was implanted by an undivided base of considerable length, and of the same size and form as the exposed part or crown. *Presented by Sir Woodbine Parish, K.H.*

518. The distal portion of the left humerus of the *Glyptodon clavipes*, in which both the outer and inner supra-condyloid plates are broken off; but they seem to have been relatively less developed than in the *Mylodon robustus*. The anterior and posterior depressions above the distal articular surface are deeper; there is no trace of a perforation above the internal condyle: the radial division of the trochlea is less convex than in the recent Armadillo. The twist of the humerus is strongly marked; the base of the strong deltoid trochanter is discernible at the fractured extremity of the bone; but on the opposite side there is a rugged raised surface for a muscular insertion, of which the analogue is not visible in the Armadillos. There is a medullary cavity in the shaft.

Presented by Sir Woodbine Parish, K.H.

519. The left radius of the *Glyptodon clavipes*: the proximal articular surface has the form of a transverse oval, which is concave from before backwards and convex from side to side: in this respect it agrees with the Armadillos and differs from the corresponding bone in the Megatherioid animals. The muscular ridges and depressions are well-marked, but less strongly than in the Mylodon. The bone assumes somewhat of a trihedral figure towards its distal end; the anterior ridge is produced below the distal articulation in the form of an obtuse, sub-compressed process; the posterior ridge terminates in a broad rugged process; the radial, which in the prone position of the bone becomes the inner side of the distal extremity, is much produced; the distal articular concavity is formed by an oblique excavation leading downwards from the posterior towards the anterior margin of the distal end; the articular surface

is divided by an oblique groove into two parts, and in some species of Armadillo this groove is represented by an entering notch.

Presented by Sir Woodbine Parish, K.H.

520. The metacarpal bone of the second digit of the left fore-foot of the *Glyptodon clavipes*. *Presented by Sir Woodbine Parish, K.H.*

521. The distal phalanx of the second digit of the left fore-foot of the same animal. *Presented by Sir Woodbine Parish, K.H.*

522. The distal phalanx of the third digit of the left fore-foot of the same animal.

In both these phalanges the proximal extremity offers a double shallow articular pulley; it is placed obliquely, so that the end of the bone must have been inclined somewhat downwards. The upper and outer margin is produced; the bone is thicker on the inner than the outer side, towards which it is slightly bent; the upper surface is evenly convex, but pitted with numerous vascular impressions, which are strongest at the margin; the under surface of the phalanx presents at its posterior half a rough convex protuberance.

Presented by Sir Woodbine Parish, K.H.

523. The shaft and distal epiphysis of the femur of the *Glyptodon clavipes*.

It is flattened from before backwards, but in a less degree than in the *Myiodon*, being more constricted laterally in the middle of the bone; above this part on the outer side there is a large projection which appears to have formed the third trochanter as in the Armadillos. The rotular articular surface is distinct from the internal condyle, the outer condyle is broken away. *Presented by Sir Woodbine Parish, K.H.*

524. The ankylosed distal extremities of the tibia and fibula of the left hind-foot of the *Glyptodon clavipes*.

The *Myiodon*, *Megalonyx* and *Scelidotherium* differ from the *Glyptodon* and the existing Armadillos in having the two bones of the leg distinct from each other; but the *Megatherium* resembles the *Glyptodon* in their ankylosis. Sufficient of the tibia remains to show that it had

the compressed form and excavated inner surface characteristic of that of the *Armadillos*; that a similar wide space separated it from the middle part of the fibula; and that the anterior margin of the bone was continued obliquely as a strong ridge to the inner angle of the distal surface. The distal articular surface presents two concavities separated by a convexity, the outer hollow being the largest and deepest; the external malleolus forms a strong process, as in the *Armadillos*; at the back part of the tibia we find also two well-marked tendinous grooves separated by a projecting ridge. The corresponding part of the skeleton of the *Megatherium* deviates widely in the proportions of the tibia and fibula, and in the conformation of the distal articular surface from that of the *Glyptodon*.

Presented by Sir Woodbine Parish, K.H.

The following fossil bones of the *Glyptodon clavipes* belong to the left hind-foot, which was articulated with the preceding specimen, and formed part of the skeleton of the same individual.

525. The astragalus. This bone agrees with the astragalus of the *Armadillos* in the form of the upper articular surface, not having the internal protuberance, which, in the *Megatherioids*, projects into the characteristic excavation at the corresponding part of the tibial articulation.

Presented by Sir Woodbine Parish, K.H.

526. The calcaneum. This, though a strong bone, has the posterior prolongation less remarkable for its length and strength than in the *Megatherioid* quadrupeds: the articulation between it and the astragalus is divided into two parts by a narrow rough groove: the cuboidal facet is distinct from the astragalar ones. In these respects the *Glyptodon* agrees with the existing *Armadillos*.

Presented by Sir Woodbine Parish, K.H.

527. The os naviculare. The posterior surface of this bone presents an uniform concavity, by which it differs from that of the *Megatherioids*, and resembles that of the recent *Armadillos*: the anterior surface presents three distinct articulations for three cuneiform bones, whilst in the *Megatherioids* there are but two such articulations.

Presented by Sir Woodbine Parish, K.H.

528. The os cuboides. There are two surfaces for two metatarsal bones on the anterior part of this bone, which, therefore, with the os naviculare, shows that the hind-foot of the Glyptodon had five toes. The os cuboides of Glyptodon deviates still more than the scaphoid bone from its analogue in the Armadillos in its remarkable antero-posterior compression: it presents an irregular oblong figure, thicker at its inner than its outer margin; the posterior surface presents a small convex articular surface for that of the os calcis, like which, the curve of the lower part is slightly angular; this surface is situated near the upper and outer margin of the bone; on the inner margin there is a long, narrow, sub-elliptic facet for the scaphoid. The inferior surface of the cuboid is divided by a deep and wide groove for the tendon of the peroneus muscle; above which is the triangular surface for the metatarsals of the two outer toes, which is bounded above by a rather sharp edge. The posterior part of the lower surface of the cuboid, like the adjoining part of the calcaneum, has been smoothed down by the play of the strong flexor tendons of the toes.

Presented by Sir Woodbine Parish, K.H.

529. The external cuneiform bone. This differs from the external cuneiform of the existing Armadillos in its remarkably compressed form; it is, in fact, a simple triangular plate of bone, with the posterior surface smooth and very slightly concave for the articulation with the scaphoid; and the anterior surface very slightly convex for the articulation with the metatarsal of the third toe: the outer contour of the bone is convex, the inner one concave: the anterior articular surface encroaches a little on this side to join a portion of the metatarsal of the second toe: on the under and outer side of the bone there is a very small facet, which touches the os cuboides. The external cuneiform bone of the Megatherium differs from that of the Glyptodon in being thicker as well as broader at its upper part; but, upon the whole, the external cuneiform bone of the Glyptodon resembles that of the Megatherium more than it does that of the Armadillos.

Presented by Sir Woodbine Parish, K.H.

530. The metatarsal bone of the second toe. This is wedge-shaped, broadest at its lower and inner sides, and narrowest at its upper and outer sides;

posteriorly it presents a flat surface for articulating with the middle cuneiform, which articulation is two inches in vertical extent and an inch and a quarter across the upper part, and proves the middle cuneiform bone to have been much smaller than the external one above described ; this articular surface of the second metatarsal is continuous at its upper and outer angle with a small triangular facet, which articulates with the external cuneiform bone ; a third oblong articular surface is continued from the preceding upon the greater part of a depression on the outer surface of the bone, and this articular surface is applied against a corresponding one on the upper and back part of the middle metatarsal. The articular surface on the anterior part of the bone for the first phalanx of the second toe is slightly convex, longer in the vertical than the transverse directions. At the under part of the bone are two trochlear surfaces for two sesamoid bones.

Presented by Sir Woodbine Parish, K.H.

531. The metatarsal bone of the third toe. The middle metatarsal bone is the largest of the three which are here preserved ; it diminishes in breadth, but greatly increases in antero-posterior thickness from the upper to the lower surface : the posterior articular surface is very slightly concave, and is nearly exclusively applied to the external cuneiform bone above described : a small portion is deflected forwards from its upper and inner side to be applied to the oblique facet in the depression on the outer side of the second metatarsal : there is a similar depression and articular facet on the upper and outer side of the present metatarsal, in which a corresponding process of the fourth metatarsal is wedged. By this structure the three metatarsals are interlocked together, and any force or concussion from the toes would thus be transferred, not only directly backwards to the tarsal bones, but obliquely from one metatarsal to another, whereby peculiar strength and security is given to the bony compages of the foot. The anterior surface of the middle metatarsal is slightly convex, two inches long by one and three quarters wide, which indicates the great bulk of the first phalanx of the middle toe : the under part of the present metatarsal bone presents two broad concave grooves for large sesamoid bones.

Presented by Sir Woodbine Parish, K.H.

532. The metatarsal bone of the fourth toe. This metatarsal is smaller than the second; its outer rough surface is convex, its inner one nearly straight, but with a small concave facet bounded by a raised ridge, and adapted to the convex articular surface in the depression on the opposed surface of the third metatarsal: the oblong posterior articular surface adapted to the os cuboides is slightly concave, with the transverse diameter equal to half the vertical one: the anterior surface for the fourth toe is triangular and nearly flat; there are two sesamoid grooves on the under part of this metatarsal bone. There are no remains of the small external or fifth toe, but its existence is indicated by a very small flat articular facet on the outer side of the fourth metatarsal bone, and by the extent of surface on the cuboid, which this metatarsal leaves uncovered.

Presented by Sir Woodbine Parish, K.H.

533. The proximal phalanx of the second toe: it is a vertically oblong, compressed plate of bone, thicker above than below in the antero-posterior direction; a protuberance rises from the middle and posterior part of the upper surface; the lower margin presents a deep and narrow notch. The posterior surface is slightly concave, the anterior one flat, with a rough spot in the centre.

Presented by Sir Woodbine Parish, K.H.

534. The middle phalanx of the second toe. This is still more compressed than the first; its greatest length or antero-posterior extent, which is at the upper part, measures only six lines, whilst its vertical diameter is twenty lines, and its transverse diameter seventeen lines; its lower margin is notched like the preceding phalanx, and at the middle of the posterior articular surface there is a central depression. From the very slight extent of motion allowed by the flattened articulations of the toes, one cannot be surprised that the synovial bag should have become in part obliterated, as these rough places in the centre of the articulating surfaces indicate to have happened.

Presented by Sir Woodbine Parish, K.H.

535. The distal or ungual phalanx of the second toe: this presents a very remarkable form; it is suddenly expanded in breadth and depth immediately beyond the articular facet adapted to the preceding phalanx, and

this facet appears thus to occupy only the middle of the posterior surface, and to be surrounded by a broad rough margin. This surface is not placed at right angles to the long axis of the phalanx, but slopes from above downwards and forwards at a very acute angle with the upper surface, so that the apex of the phalanx points almost directly downwards; the inferior boundary of the posterior surface forms a rough ridge, separated by a smooth narrow concavity from the anterior border of the phalanx: the superior sloping surface is slightly convex, and deeply pitted and sculptured with vascular grooves and impressions.

Presented by Sir Woodbine Parish, K.H.

536. The middle phalanx of the third toe. This phalanx is more square-shaped and broader than that of the second; it has the same general compressed form, with nearly flat articular surfaces, but being narrower above, it resembles an inverted wedge: it is also notched, but less deeply, below, and has an articular facet for a sesamoid bone on each side of the notch.

Presented by Sir Woodbine Parish, K.H.

537. The unguis phalanx of the third toe. This is broader but shorter than the preceding, and is of a more symmetrical figure: the lower margin of its posterior surface forms a broader ridge, and the articular surface is a little more convex; but the resemblance is otherwise very close.

Presented by Sir Woodbine Parish, K.H.

538. The middle phalanx of the fourth toe.

Presented by Sir Woodbine Parish, K.H.

539. The unguis phalanx of the fourth toe. This bone has the same general form as the preceding, but is smaller; like the last phalanx of the second toe, it is unsymmetrical, but from a different modification: in the second toe the inner margin is rounded off towards the outer one, in the fourth toe the outer margin is rounded off towards the inner one.

Presented by Sir Woodbine Parish, K.H.

540. The unguis phalanx of the fifth toe.

Presented by Sir Woodbine Parish, K.H.

In the *Glyptodon* the hind foot appears to have been expressly modi-

fied to form the base of a column destined to support an enormous superincumbent weight, such as must have resulted from the thick ossified integument of this bulky loricate quadruped; whilst in regard to the Megatherium one would infer that the bulky body had not been covered by an expanded bony coat of mail, from the very circumstance that the toes were developed to sustain and wield long and compressed claws, such as form the compensating weapons of defence of the hair-clad Sloths and Anteaters. The unguinal phalanges of the mailed Armadillos, in their shorter, broader, and flatter form, make a much nearer approach to those of the Glyptodon. But when the bones of the hinder extremity above described are arranged in their natural relative positions, they present to our observation the framework of a foot of such a construction and form as is without a parallel in the animal kingdom: the nearest approach to its broad, thick, short and massive proportions is made by the skeleton of the fossorial extremity of the Mole; but it is the fore-foot only of this animal that can be compared, in the compressed bulky figure of the metacarpals and proximal and middle phalanges, with the singular hinder extremity of the *Glyptodon clavipes*. The hind-foot of the Mole resembles, in the lengthened metatarsal and phalangeal bones, that of the existing Armadillos, and the generality of unguiculate quadrupeds.

541. The almost entire carapace of the *Glyptodon clavipes*.

It is composed of thick, pentagonal ossicles united together at their margins by sutures: smooth on the inner surface where the sutures are most conspicuous, rough and sculptured on the external surface according to a definite pattern characteristic of the species, the whole forming a symmetrical, oval, convex, bony case or shell which covered and defended the upper and lateral parts of the entire trunk of the animal.

The following are the dimensions of this carapace:—

	feet.	inches.
Length, following the curve of the back	5	7
Ditto in a straight line, or the chord of the arc	4	8
Breadth, following the curve of the middle of the back	7	4
Ditto in a straight line, or the chord of the arc	3	2½
Ditto of the anterior outlet or arched margin, at the base of the arch	1	5
Ditto of the posterior outlet, at do.	1	8

The component ossicles support on their outer surface a central, large, subpentagonal or subcircular flattened eminence, surrounded generally by five or six smaller discs; both being rough, but especially the peripheral ones. In the ossicles near the margins of the carapace the middle eminence increases, whilst the peripheral tubercles diminish or disappear. At the anterior margin the middle eminence extends outwards and forwards as a transversely oblong obtuse projection; at the lower margins near the posterior part of the carapace it extends outwards in the form of an angular process: the ossicles at the posterior margin are the largest, and have a pentagonal shield-shaped figure; the two smaller sides being wedged into the interspace of the two ossicles of the penultimate row.

None of the ossicles are modified, as in the smaller *Armadillos*, to form transverse bands connected together by moveable joints, and allowing the carapace to be closed over the retracted head and legs: such a defensive modification of the bony armour was not required for the gigantic *Glyptodon*.

There are forty-four transverse series of ossicles in the present carapace which extend from above, downwards and obliquely backwards: the longest series at the middle and broadest part of the carapace contain each seventy ossicles; the number gradually decreasing, as the carapace contracts in width towards the two extremities, the anterior margin being composed of sixteen ossicles, the posterior one of twenty-five ossicles: the total number of these dermal bones may be estimated at above two thousand in the carapace of the trunk of the *Glyptodon clavipes*. To these, in the consideration of the dermo-skeleton of the extinct species, must be added the casque defending the head and the verticillate armour of the short and thick tail, both of which are deficient in the present specimen.

From the tertiary deposits of the Pampas of Buenos Ayres.

Purchased.

542. An anterior marginal ossicle of the carapace of the *Glyptodon clavipes*.

From the tertiary deposits of the Pampas of Buenos Ayres.

Purchased.

fied to form the base of a column destined to support an enormous superincumbent weight, such as must have resulted from the thick ossified integument of this bulky loricate quadruped; whilst in regard to the Megatherium one would infer that the bulky body had not been covered by an expanded bony coat of mail, from the very circumstance that the toes were developed to sustain and wield long and compressed claws, such as form the compensating weapons of defence of the hair-clad Sloths and Anteaters. The unguial phalanges of the mailed Armadillos, in their shorter, broader, and flatter form, make a much nearer approach to those of the Glyptodon. But when the bones of the hinder extremity above described are arranged in their natural relative positions, they present to our observation the framework of a foot of such a construction and form as is without a parallel in the animal kingdom: the nearest approach to its broad, thick, short and massive proportions is made by the skeleton of the fossorial extremity of the Mole; but it is the fore-foot only of this animal that can be compared, in the compressed bulky figure of the metacarpals and proximal and middle phalanges, with the singular hinder extremity of the *Glyptodon clavipes*. The hind-foot of the Mole resembles, in the lengthened metatarsal and phalangeal bones, that of the existing Armadillos, and the generality of unguiculate quadrupeds.

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From the tertiary deposits of the Pampas of Buenos Ayres.

Purchased.

542. An anterior marginal ossicle of the carapace of the *Glyptodon clavipes*.

From the tertiary deposits of the Pampas of Buenos Ayres.

Purchased.

543. An inferior marginal ossicle of the carapace of the *Glyptodon clavipes*.
From the tertiary deposits of the Pampas of Buenos Ayres.
Purchased.
544. An inferior marginal ossicle of the carapace of the *Glyptodon clavipes*.
From the tertiary deposits of the Pampas of Buenos Ayres.
Purchased.
545. An inferior marginal ossicle of the carapace of the *Glyptodon clavipes*.
From the tertiary deposits of the Pampas of Buenos Ayres.
Purchased.
546. An anterior marginal ossicle, with two ossicles of the second, and two of the third transverse rows in natural union; the latter well show the characteristic expansion of the middle surface.
From the tertiary deposits of the Pampas of Buenos Ayres.
Purchased.
547. A marginal and four contiguous ossicles of the carapace of the *Glyptodon clavipes*.
From the tertiary deposits of the Pampas of Buenos Ayres.
Purchased.
548. A small portion of the carapace of the *Glyptodon clavipes*, including seven of the component ossicles; the sutures are very well displayed on the internal surface, and two or three smaller ossicula may be here seen, wedged like 'ossa wormiana' into the interspaces of the sutures.
From the tertiary deposits of the Pampas of Buenos Ayres.
Purchased.
549. Various detached ossicles of the carapace of the *Glyptodon clavipes*.
From the tertiary deposits of the Pampas of Buenos Ayres.
Purchased.
550. Various detached ossicles of the carapace of the *Glyptodon clavipes*.
From the tertiary deposits of the Pampas of Buenos Ayres.
Purchased.
551. A portion of the carapace of the *Glyptodon clavipes*: it is from near the anterior part and includes five of the modified marginal ossicles. The

individual to which it belonged appears to have been aged, as the sutures of the ossicles are nearly obliterated by ankylosis.

From the tertiary deposits near the Rio Matanza, about twenty miles to the south of the city of Buenos Ayres.

Presented by Sir Woodbine Parish, K.H.

552. Several pieces of the carapace of apparently the same individual of the *Glyptodon clavipes*, and from the same locality.

Presented by Sir Woodbine Parish, K.H.

553. A model in plaster of the foregoing pieces of the carapace of the *Glyptodon clavipes*, in natural juxtaposition. They form together a portion measuring three feet six inches across, but with only one of the margins entire; this includes seven of the modified ossicles which show the transition from the obtuse to the pointed form of the projecting portions.

554. A portion of a carapace including four or five dermal ossicles of a smaller species of *Glyptodon* (*Glypt. ornatus*, OWEN).

The outer surface of the ossicles is relatively smoother and the central disc smaller as compared with the peripheral discs, which are seven in number in each ossicle, and give its exterior surface the figure of a rosette.

From the tertiary deposits near the Rio Matanza, about twenty miles to the south of the city of Buenos Ayres.

Presented by Sir Woodbine Parish, K.H.

555. Another portion of the carapace of apparently the same smaller species of *Glyptodon*, showing the projecting angular ossicles of the margin.

From the tertiary deposits near the Rio Matanza, about twenty miles to the south of the city of Buenos Ayres.

Presented by Sir Woodbine Parish, K.H.

556. A portion of the carapace of a gigantic Armadillo, as large as the *Glyptodon clavipes*, but differing in the sculpturing of the external surface of the component ossicles, in which the peripheral raised portions are of equal size with the central one, making the whole exterior appear to be impressed by channels, in form of a net-work: the species indicated by this fragment may be termed *Glyptodon reticulatus*.

From the tertiary deposits near the Rio Matanza, about twenty miles to the south of the city of Buenos Ayres.

Presented by Sir Woodbine Parish, K.H.

557. A larger portion of the carapace of the *Glyptodon reticulatus*, in which the sutures of the component ossicles are obliterated.

From the tertiary deposits near the Rio Matanza, about twenty miles to the south of the city of Buenos Ayres.

Presented by Sir Woodbine Parish, K.H.

558. A fragment of the carapace of a gigantic extinct Armadillo, nearly equalling in thickness the preceding specimen, but having the outer surface of the ossicles divided into much more numerous elevations, separated by narrower channels which unite to form a closer net-work: each eminence or tubercle, of which there are between forty and fifty on each ossicle, has a punctate surface; the species indicated by the carapace of the present pattern may be named *Glyptodon tuberculatus*.

From the tertiary deposits in the Pampas of Buenos Ayres.

Purchased.

559. A fragment of the carapace of the *Glyptodon tuberculatus*, in which the component ossicles are square-shaped, and, although the sutures are close on the smooth internal surface, yet the tuberculated external surfaces of the ossicles are divided by deep channels. The size and shape of the tubercles are so similar to those in the foregoing specimen as to lead to the suspicion that the different form of the ossicles may have depended on a modification of a particular part of the carapace. The analogy, however, of the *Glyptodon clavipes*, in which species the specimen No. 541 affords the opportunity of studying the extent of modification to which the constituent ossicles are subject in the entire carapace, militates strongly against the supposition that the various sculpturing exhibited in Nos. 554, 556 and 558, could have characterised particular parts of the carapace of the same species.

From the tertiary deposits in the Pampas of Buenos Ayres.

Purchased.

Order PACHYDERMA.

Family *Toxodontidæ*.

Genus *Toxodon*.

560. The skull, without the lower jaw, of the *Toxodon platensis*, Owen.

This fine and unique specimen was discovered in a whitish argillaceous earth, on the banks of the Sarandis, about 120 miles to the north-west of Monte Video, South America.

Though mutilated and literally broken in pieces when transmitted to the Museum, the cranium was susceptible of the degree of restoration in which it is now exhibited, and demonstrates all those characters from which a general physiological idea may be formed of the nature and habits of the animal, and consequently of its zoological affinities. The remarkable nature of these affinities and the rarity of the specimen appear to call for the following detailed description of it.

The dimensions of the cranium of the *Toxodon platensis* amply attest that the animal to which it belonged was of a magnitude attained by few terrestrial quadrupeds, and only to be compared, in this respect, with the larger ordinary Pachyderms, or the extinct Megatherium. The length of the skull is two feet four inches; the extreme breadth one foot four inches.

The general form of the skull, without the lower jaw, is semi-ovate, depressed, elongate, of considerable breadth including the span of the zygomatic arches; but becoming rather suddenly contracted anterior to them, the facial part being considerably produced, and gradually contracting to near the muzzle, which again slightly expands.

Among the first peculiarities which strike the observer, is the aspect of the plane of the occipital foramen, and of the occipital or posterior region of the cranium, both of which incline from below upwards and forwards at an angle of 75° with the basal line of the skull. This slope of the back part of the skull is one of the striking characteristics of the

Deinotherium, it is common to all the Cetacea, and is met with in a slighter degree in the great Ant-eater and some others of the Edentate order. The corresponding position of the foramen magnum presents nearly the opposite extreme to man in the occipital scale, proposed by Daubenton as a test of the intelligence of animals; and the indication of the limited capacity of the *Toxodon* thus afforded, is confirmed by the very small proportion which the cerebral cavity bears to the zygomatic and maxillary arches and to the size of the spinal chord which is indicated by the foramen magnum. A great proportion of the outer table of the skull is broken away, exposing a coarse and thick diploë; but the form of the remaining parts, which are modified in relation to the attachment of the muscles of the jaws, indicates that these were powerfully developed. The general form of the skull, while it presents certain points of resemblance with that of the aquatic *Pachydermata*, and even of the *Carnivora*, has much that is peculiar to itself; but, upon the whole, approaches the nearest to that of the *Rodentia*; and the dentition of the *Toxodon*, as exhibited in the upper jaw, corresponds with that which characterizes the Rodent order, but with certain deviations, indicative of a transition to the *Pachydermata*; a transition of the most interesting character, inasmuch as there is an evident approach to the Pachydermatous order, in the hoof-like claws, thinly covered hide, and heavy proportions of the Capybara; and some less obvious affinities were long ago detected by Cuvier between the minutest genera of Rodents and the gigantic Proboscidian Pachyderms.

The teeth of the *Toxodon* consist of molars and incisors, separated by a long diastema, or toothless space. In the upper jaw the molars are *fourteen* in number, there being *seven* on each side; the incisors *four*, one very large, and one small, in each intermaxillary bone.

The general form and nature of the teeth are indicated by the sockets, and the structure of the grinders is exhibited in a broken molar, the last in the series on the left side of the present skull; and by another perfect molar, the last but one on the right side of the upper jaw, which, though not belonging to the same individual as the skull here described, undoubtedly appertains to the same species.

This tooth was found by itself, imbedded in the banks of the Rio Tercero, or Carcacana, near the Parana, at the distance of a hundred and eighty miles from the locality where the head was discovered. Fragments of a molar tooth of a *Toxodon*, apparently the seventh of the left side, upper jaw, were also found at Bajada de St. Fé, in the province of Entre Rios, distant forty miles from the mouth of the Rio Tercero.

All the molar teeth are long and curved, and without fangs, as in the herbivorous species of the Rodent order: in those, however, with curved grinders, as the *Aperca*, or Guinea-pig, the concavity of the upper grinders is directed outward, the fangs of the teeth of the opposite sides diverging as they ascend in the sockets; but in the *Toxodon* the convexity of the grinders is outward, and the fangs converge and almost meet at the middle line of the palate, forming a series of arches, capable of resisting great pressure. It is this structure which suggested to me the generic term proposed for this extinct Mammal*.

Of the incisors, the two small ones are situated in the middle of the front of the intermaxillaries, and the two large ones in close contiguity with the small incisors, which they greatly exceed in size. The sockets of the two large incisors extend backwards, in an arched form, preserving a uniform diameter, as far as the commencement of the alveoli of the molar teeth; the curve which they describe is the segment of a circle; the position, form, and extent of the sockets are such as are only found in those of the corresponding teeth of the Rodentia among existing Mammalia.

The matrix, or formative pulp of the large incisors, was lodged, as in the Rodentia, in close contiguity with the sockets of the anterior molars; and we are enabled to infer, from the form of the socket, notwithstanding the absence of the teeth themselves, that the pulp was persistent, and that the growth of these incisors, like those of the Rodentia, continued throughout life.

This condition, joined with the curvature of the socket, necessarily implies a constant wearing away of the crown of the tooth, by attrition against opposing incisors of a corresponding structure in the lower jaw: and

* Τόξον, *arcus*; ὀδὸς, *dens*.

as a corollary, we infer that the teeth in question had a partial coating of enamel, to produce a cutting edge, and were, in fact, true *dentes scalprarii*. The number of incisors in the upper jaw of *Toxodon*,—four, instead of two—is not without its parallel in the Rodent order, the genus *Lepus* being characterized by a similar number of incisors, and of a similar relative size, but with a different relative position, the small incisors in the Hare and Rabbit being so placed immediately behind the large pair, as to receive the appulse of the single pair of incisors in the lower jaw.

As the sockets of the small mesial incisors of *Toxodon* gradually diminish in size as they penetrate the intermaxillary bones, we may infer that the pulp was gradually absorbed in the progress of their development; and that, like ordinary incisors, their growth was of limited duration, and their lodgement in the jaw effected by a single conical fang.

The orbit of the *Toxodon* forms the anterior boundary of the zygomatic area; it is about as distinctly defined as in the Tapir or Dugong, having its osseous rim less complete than in the Hippopotamus, yet more developed than in the Capybara, Coypus, and many other Rodents, in which the orbit is scarcely distinguishable in the cranium from the small space occupied by the origin of the temporal muscle. The lower boundary of the orbit in the *Toxodon* is formed by an excavation in the upper and anterior part of the zygoma; the upper boundary by a strong and rugged overarching process of the frontal bone, the posterior angle of which descends a little way, but leaves a space of three inches and a half between it and the opposite angle of the malar bone below, the circumference of the orbit being completed probably by ligament in the recent subject. The cavity thus circumscribed is remarkable for the preponderance of the vertical over the transverse or longitudinal diameter, and indicates great extent of motion of the eyeball in the vertical direction, such as may be supposed to be well adapted to the exigencies of an amphibious quadruped. The orbit of the Capybara, or Water Hog, makes a near approach to the form just described. In the elevation of the supra-orbital boundary, and its outward projection, in the *Toxodon*, we perceive an approximation to the form of the orbit in the Hippopo-

tamus, but the size of the orbit is relatively larger in the *Toxodon*, which in this respect manifests its affinity to the *Rodentia*.

In that part of the bony structure of the auditory apparatus which is visible on the exterior of the cranium, the skull of the *Toxodon* presents a character in which it recedes from the *Rodentia*. In these quadrupeds the tympanic portion of the temporal bone is remarkably developed, forming a large bulla ossea between the glenoid cavity and the occiput; and it always remains disunited from the other elements of the temporal bone. In the *Toxodon* the tympanic bone consists of a rough, compressed, vertical, osseous plate, wedged in transversely between the occiput and the posterior part of the glenoid cavity. The internal extremity of this plate points inwards and forwards, representing the styloid process; behind this is seen the petrous bone, which forms a small angular protuberance at the basis cranii, and is less developed than in the Hippopotamus. Anterior to the petrous bone are the orifices of the Eustachian tube and carotid canal, external to it is the great foramen lacerum for the jugular vein and nervus vagus, and behind it is the anterior condyloid foramen. The foramen auditorium externum is only half an inch in diameter, and gives passage to a long and somewhat tortuous meatus, which passes inwards and slightly forwards and downwards; its direction being precisely the same as in the Hippopotamus; it was accompanied probably by as small an external auricle.

But the indication of the aquatic habits of the *Toxodon*, which are presented by the osseous parts relating to the senses of sight and hearing, is of minor import compared with those afforded by the bony boundary of the nostrils. This boundary circumscribes a large ovate aperture, the aspect of whose plane is upwards, and a little forwards, as in the Herbivorous Cetaceans and especially the Manatee (*Trichecus Manatus*, Cuv.). In one part of the bony structure of the nasal cavity the *Toxodon* deviates, however, in a marked degree from the cetaceous organisation, viz. in the presence of frontal air-sinuses, which are exposed by the fracture of the upper part of the skull. The posterior orifice of the nasal cavity is relatively larger and wider than in the Herbivorous Cetaceans, and differs both in form and aspect, in consequence of the greater extent of

the bony palate. The *Toxodon* further differs from the Manatee and Dugong in the firm nature of the connexion of the bones of the head; and it differs from the Hippopotamus in the strong attachment of the intermaxillary bones to the maxillaries.

The anterior part of the zygoma is formed externally by the malar bone, which in its position is intermediate to the Rodent and Pachydermatous structures. It is not suspended in the middle of the zygomatic arch, as in the former order, neither does it extend into the region of the face so far anterior to the orbit as in the Tapir or Hippopotamus. The exterior line of the malo-maxillary suture defines the orbit anteriorly; but from this line the maxillary bone extends backwards, along the inner side of the malar portion of the zygoma, until it almost reaches the temporo-malar suture; thus abutting by an oblique surface against nearly the whole internal facet of the malar bone, and materially contributing to the general strength of the zygomatic arch. The malar bone is of considerable vertical extent, and presents a rugged and thickened inferior margin for the attachment of the masseter. The upper margin of the malar bone is smoothly rounded, and presents a regular semicircular excavation, forming the lower boundary of the orbit. The relative magnitude of the zygomata to the entire cranium far exceeds in the *Toxodon* that which exists in the Hippopotamus or any other known Pachyderm. This arises from the great vertical development of the malar bone behind the orbit, and the vertical expansion of the temporal portion of the arch. The oblique position of the zygoma, descending as it advances forwards, is deserving of attention, as the *Toxodon*, in deviating from the Pachyderms in these respects, makes an evident approach to the herbivorous Cetaceans, as the Dugong and Manatee: in the latter Cetacean we observe a similar development of the lower part of the zygomatic process of the malar bone. It is here, also, that we may perceive an indication of a resemblance between the *Megatherium* and *Toxodon*.

There is no discernible trace of the lachrymal bone having extended, as in the Hippopotamus, beyond the anterior boundary of the orbit: the lachrymal foramen is situated rather deeply in the orbit, and the bone itself appears to have been of very small size.

The surface of the supra-orbital process of the frontal bone is deserving of attention : as it presents a peculiar ruggedness which is not found in any other part of the skull, the irregularity seems, as it were, to have been produced by the impression of numerous small tortuous and anastomosing vessels. In the skull of a Sumatran two-horned Rhinoceros in the Museum of the College (No. 816), the circumference of that part of the surface of the skull which supported the posterior horn, and which includes precisely the same part of the os frontis, presents the same character, the surface being broken by numerous vascular impressions. On the supposition that this character of the supra-orbital arch in the *Toxodon* might indicate the superincumbency of a bony case, I examined the skulls of two Armadillos, *Dasypus Peba* and *Das. sex-cinctus*, and found that in the *Dasypus sex-cinctus*, the supra-orbital ridges, which are slightly elevated to support the cephalic plate, presented, in a minor degree, a corresponding rugosity. It may be conjectured, therefore, either that the *Toxodon* was defended by an ossified integument like the Armadillo, or that it was armed with an epidermic production analogous to the horn of the Rhinoceros ; or that the rugous surface in question had as little relation with the parts that covered it, as the sculptured surface of the malar bones in the Cavy.

The cavity of the nose is extensive, and the remains of the ossa spongiosa superiora testify that the *Toxodon* enjoyed the sense of smell to a degree equal at least to that of the Hippopotamus.

The superior maxillary bones are united posteriorly to the malar, they ascend and join the frontal and nasal bones, their outer surface is almost vertical, is smooth, and slightly undulating, is perforated at its posterior part by the ant-orbital foramen, and joined anteriorly to the intermaxillaries by a suture running in the sigmoid direction from the middle of the nasal cavity to within four inches of the anterior boundary of the upper jaw. We have in the position and extent of this suture, and the absence of tusks and their large prominent sockets, a most important difference between the *Toxodon* and Hippopotamus. The chief peculiarity in the maxillary bones obtains in the arched form of the alveolar processes, corresponding with the shape and position of the grinders

above described, and which are peculiar among known Mammalia to the present genus. The palatal surface of the maxillary bones is obliquely perforated by two large foramina, from which two deep longitudinal grooves extend forwards and are gradually lost; we find the posterior palatine foramina represented by similar grooves and foramina in the *Capybara*.

The intermaxillary bones, though large, are relatively of less extent than in the Rodents generally. The nasal processes do not reach the frontal bone, but are limited to the anterior half of the nasal boundary; approaching in this respect to the Herbivorous Cetacea. In the outward expansion of their anterior extremities, the intermaxillaries resemble those of the Hippopotamus, in which however this character is more strongly marked. The intermaxillaries in the Hippopotamus are also much less firmly united to the maxillary bones than in the *Toxodon*, and are consequently commonly lost in the fossil crania. On the palatal surface of the intermaxillary bones there are two grooves which diverge forwards from the line of the suture; and anteriorly to these grooves there are the two large anterior palatine foramina. The maxillo-intermaxillary sutures on the palate converge as they extend backwards to a point; there appears to have been a fissure left between this suture and the mesial suture of the intermaxillaries; in which structure the *Toxodon* resembles the Hippopotamus.

The sum of the different affinities, or indications of affinity, which are deducible from the cranium of this most curious and interesting fossil mammal, establishes the conclusion that the *Toxodon* is referrible to the order *Pachydermata*. But the structure, form and kind of teeth in the upper jaw, show that the gigantic *Toxodon* was intimately related to the Rodent order. From the characters of this order, as afforded by the existing species, the *Toxodon*, however, differs in the relative position of the supernumerary incisors, and in the number and direction of the curvature of the molars.

The *Toxodon* again differs from the true Rodents, and resembles the Wombat and the *Pachyderms* in the transverse direction of the articular cavity of the lower jaw.

It deviates from the *Rodentia* and approximates to the *Pachydermata*

in the relative position of the glenoid cavities and zygomatic arches, and in many minor details already alluded to.

In the aspect of the plane of the occipital foramen and occipital region of the skull, in the form and position of the occipital condyles, in the aspect of the plane of the anterior bony aperture of the nostrils, and in the thickness and texture of the osseous parietes of the skull, the *Toxodon* deviates both from the *Rodentia* and existing *Pachydermata*, and manifests an affinity to the *Dinotherium* and Cetaceous order, especially the Herbivorous section.

At present we possess no evidence to determine whether the extremities of the *Toxodon* were organized on the ungulate or unguiculate type, nor can we be positive, from the characters which the skull affords, that the genus may not be referrible to the *Mutica* of Linnæus, although the development of the nasal cavity, and the presence of large frontal sinuses render it extremely improbable that the habits of this species were so strictly aquatic, as the total absence of hinder extremities would occasion.

Where the dentition of a mammiferous animal is strictly carnivorous, this structure is obviously incompatible with a foot incased in a hoof; but where the teeth are adapted for triturating vegetable substances the case is different. If animals so characterized are of small size, and seek their food in trees, or if they burrow for roots or for shelter, the vegetable type of dentition must co-exist with unguiculate extremities, as in the *Edentata* and *Rodentia* generally; but the largest genus (*Hydrochærus*) of the Rodent order, whose affinity to the *Pachydermata* is manifested in its heavy shapeless trunk, thinly scattered bristly hair, and many other particulars, has each of its toes inclosed in a miniature hoof.

The affinity above alluded to is too obvious to have escaped popular notice, and the *Capibara* from its aquatic habits has obtained the name of Water-hog. It is highly interesting to find that the continent to which this existing aberrant form of Rodent is peculiar, should be found to contain the remains of an extinct genus, characterized by a dentition which closely resembles the Rodent type, but manifesting it on a gigantic scale, and tending to complete the chain of affinities which links the *Pachydermatous* with the Rodent and Cetaceous orders.

Discovered and presented by Charles Darwin, Esq., F.R.S.

561. The sixth molar tooth, left side, upper jaw of the *Toxodon platensis*.

It is curved, with the convexity turned outwards when lodged in the socket, contrary to the position of the superior curved molars in the Guinea-pig and Wombat. The outer surface of the tooth is traversed by two slight convex longitudinal risings : the inner side presents, anteriorly, a slightly concave surface, and posteriorly two prominent longitudinal convex ridges separated by a deep channel, which is flat at the bottom : a fold of enamel is continued from the anterior angle of this channel obliquely forwards half-way across the body of the tooth. The outer coat of enamel is interrupted at the anterior and posterior margins of the grinder.

From the tertiary deposits in the banks of the Rio Tercero near the Parana, South America.

Presented by Charles Darwin, Esq., F.R.S.

562. A portion of the right ramus of the lower jaw of the *Toxodon platensis*.

563. A smaller portion of the left ramus of the same lower jaw of the *Toxodon platensis*.

These were discovered at Bahia Blanca, in latitude 39°, on the east coast of South America.

Presented by Charles Darwin, Esq., F.R.S.

The molar teeth in this mutilated lower jaw, like those in the upper jaw of the *Toxodon*, had persistent pulps, as is proved by the conical cavity at their base : they consequently required a deep socket and a corresponding extent of jaw to form the sockets and protect the pulps. In order to economize space and to increase the power of resistance in the tooth, and perhaps also to diminish the effects of direct pressure on the highly vascular and sensible matrix, the molars and their sockets are curved, but in a less degree than those of the upper jaw of the *Toxodon*. They correspond, however, with the superior molars of the *Toxodon* in the antero-posterior diameter, in being small and simple at the anterior part of the jaw, and by increasing in magnitude and complexity as they are situated more posteriorly. They are, however, narrower from side to

side, the *Toxodon* agreeing in this respect with most other large herbivorous Mammalia, the fixed surface for attrition in the upper jaw being from obvious principles more extensive than the opposed moveable surface in the lower jaw.

The first grinder in the lower jaw is of small size and simple structure, being surrounded with a coating of enamel of uniform thickness and without any fold penetrating the substance of the tooth. It is more curved than any of the other molars, and appears to have differed from the external incisor only in its entire coating of enamel and direction of growth: it is interesting, indeed, to find so gradual a transition, in structure, from molar to incisive teeth as this jaw presents; for the robust incisors may here be regarded as representing molars simplified by the partial deficiency of enamel, and with a change in their direction.

The second molar presents an increase in antero-posterior diameter, and in length, and the enamel of the middle of the outer side makes a fold which penetrates a little way into the tooth; the line of enamel on the inner side is slightly concave and unbroken.

The third molar presents an increase of dimensions in the same directions as the second; the enamel on the outer side of the tooth presents a similar fold, but it is directed a little more backwards.

In the fourth molar, besides a further increase of size and a corresponding but deeper fold of enamel on the external side of the tooth, the grinding surface is rendered more complicated by two folds of enamel entering the substance of the tooth from the inner side: these folds divide the antero-posterior extent of the tooth into three nearly equal parts; they are both directed obliquely forwards, half-way across the substance of the dentine.

The fifth molar presents the same structure as the fourth, which it exceeds only slightly in size.

The sixth molar presents a proportionately greater increase of size in the antero-posterior diameter, which measures two inches; but the lateral diameter is but slightly augmented; its structure resembles that of the fifth.

The outer coat of enamel is interrupted for a brief space at the ante-

rior and at the posterior margin of each of the above teeth, as in the upper molar, No. 561.

564. The symphysis of the lower jaw, with the sockets and roots of the incisive teeth, of the *Toxodon platensis*.

Discovered with the foregoing fragments of the lower jaw, at Bahia Blanea, in latitude 39°, on the east coast of South America.

Presented by Charles Darwin, Esq., F.R.S.

From the remains of the symphysis it will be seen that the jaw was remarkably compressed or narrow from side to side ; while the rami were of considerable depth, in order to give lodgement to the matrices and bases of grinders enjoying uninterrupted growth. The pulps of the six incisors in the lower jaw are arranged in a pretty regular semicircle, whose convexity is downwards ; the teeth themselves are directed forwards and curved upwards like the inferior incisors of the *Rodentia*. The form and degree of the curvature are shown in the almost perfect incisor (No. 565), which was found in the same stratum, but belonging to another individual. These incisors are nearly equal in size : they are all hollow at their base, and the indurated mineral substance impacted in their basal cavities well exhibits the form of the vascular pulps which originally occupied them. Sufficient of the tooth itself remains in four of the sockets to show that the broken incisors, like the nearly perfect one, had only a partial investment of enamel : but though in this respect, as well as in the curvature and perpetual growth, they resemble the ‘*dentés scalprarii*’ of the *Rodentia*, they differ in having a prismatic figure, like the inferior incisors of the Sumatran Rhinoceros or the tusks of the Boar. Two of the sides, viz. those forming the anterior convex and mesial surfaces of the incisor, have a coating of enamel about half a line in thickness which terminates at the angles between these and the posterior or concave surface.

From the relative position of the bases or roots of these incisors, we may infer that they diverged from each other as they advanced forwards in order to bring their broadest cutting surface into line. That they were opposed to teeth of a corresponding structure in the upper jaw, is proved

by the oblique chisel-like cutting surface of the more perfect incisor : and it is not without interest to find that the presence of ‘*dentes scalprarii*’ at the anterior part of the mouth has not been necessarily limited to Mammalia of small size.

565. A left lower incisive tooth of the *Toxodon platensis*.

From the cliffs at Bahia Blanca.

Presented by Charles Darwin, Esq., F.R.S.

Family *Proboscidea*.

Genus *Elephas*.

The following series of the molar teeth of the fossil Elephant or Mammoth is subdivided so as to illustrate first, their *form*,—second, their *structure*,—third, their *growth*,—and fourth, their *varieties*.

Form.

566. An upper molar tooth of the right side, of a full-grown and probably aged Mammoth (*Elephas primigenius*, Blum.).

It presents an equilateral triangular figure, the narrow base being formed by the grinding or exposed surface of the tooth ; and it consists, as in the existing Elephants, of a crown and fangs, the crown deeply cleft by transverse parallel fissures into a series of broad and thin plates, which, being developed from their summits towards the common uniting base, continue separate, or joined together only by the adhesion of their outer covering of cement, until the base of the crown and the fangs begin to be formed. As each lamellar division of the crown is covered by a layer of enamel and then by a layer of cement, they represent, while ununited, distinct teeth, and are then termed ‘*denticules*.’ Each plate is also subdivided by vertical fissures extending from the apical margin to unequal depths, and as calcification commences at the apices of these subdivisions, so each plate or denticule consists at the beginning of a series

of distinct slender cylindrical columns, and might be regarded as an aggregate of separate cylindrical denticules with the same reason as the entire molar tooth has been described to consist of an aggregate of lamelliform denticules. The cylindrical denticules are, however, ultimately blended together by a common dentinal base, constituting the lamelliform denticle: and these denticles in like manner next coalesce to form the common dentinal base of the molar tooth, from which the true roots of the tooth are developed. Thus the apparent independency of the cylindrical and lamelliform denticles depends upon an incomplete state of the development of a complex but essentially single and individual tooth.

The development of this complex tooth has proceeded in the extinct, as it does in the existing Elephant, not only from the summit to the base, but from the fore to the back part: in the present example, the anterior part of the tooth shows the lamelliform divisions of the crown worn down to the common base, which is supported by well-developed fangs; at the back part of the tooth the columnar or cylindrical portions of the constituent plates are not yet united by the calcification of the continuous lamelliform base, and the plates so formed may be observed in every successive stage of growth as they advance towards the part where their own uniting base and the fangs begin to be formed.

The present fossil grinder is fourteen inches in length, the antero-posterior extent of the grinding surface is seven inches, the transverse diameter three inches and a half. The crown is divided into twenty-two lamellæ, ten of which have come into use; the middle mammillary process of the posterior and least abraded lamellæ is twice the breadth of the marginal processes; but, as the lamellæ advance in position, the marginal mammillæ acquire the breadth of the median one, and the whole become blended together in the more abraded plates.

The enamel boundary of the transverse plates is plicated like a frill in this tooth.

From British drift or pleistocene beds.

Hunterian.

567. The lower molar tooth of the right side of the same Mammoth.

It presents a more elongated and curved form, and the grinding surface is slightly concave and adapted to the convexity of that of the upper tooth. The same gradational state of the development of the tooth from the posterior separate cylindrical or digital processes of the plates to their union at the base of the plate, and the blending of the plates themselves at the base of the crown, the development of fangs from, and the wearing down of the plates to, this base, are as instructively shown in this as in the upper grinder. The crown of this lower molar is divided into twenty-seven plates, twelve of which have come into use: in the posterior of these the middle mammillary process is abraded: the fourth in advance exhibits five mammillary processes, the three middle ones being nearer to each other than to the two lateral ones, the next in advance has the three middle processes worn down to a single cavity. As the lamellæ advance they increase in breadth, by the widening of the lateral mammillary processes which are worn down to their broader part: in the three anterior plates the lamellæ are blended together into one depression. The enamel capsules of the ivory plates are strongly plicated like a frill.

The length of this molar tooth, following the curve on its outer side, is one foot seven inches: the posterior and last-formed plates are folded upwards and laterally upon the rest, their sides being parallel to the grinding surface of the tooth.

From British drift or pleistocene beds.

Hunterian.

567¹. An upper molar of an Indian Elephant (*Elephas indicus*, Cuv.), for comparison with No. 562. It differs from the fossil in being relatively narrower or of less diameter transversely. The lamellæ are less deeply cleft, and the digital or mammillary processes of their summits are shorter. The length of the tooth is twelve inches; that of the grinding surface is five inches; its breadth two inches nine lines. The crown is divided into twenty-two plates, of which nine have come into use. *Hunterian.*

567². A lower molar of an Indian Elephant, for comparison with No. 567. It is shorter in proportion to its depth, is divided into relatively fewer plates, and these are less deeply and less numerous subdivided into digital processes. The length of the tooth is twelve inches, and it is

divided into eighteen plates ; eleven of these have come into use ; the length of the grinding surface being six inches nine lines, its breadth two inches nine lines. *Hunterian.*

Structure.

568. A polished vertical longitudinal section of the superior molar of the Mammoth.

It shows the great depth and number of the descending transverse folds of enamel, and the continuous base of dentine from which the thin lamellar processes arise that are invested by the enamel. The different degrees of density of the three constituent substances, dentine, enamel and cement, are manifested by the different degrees of polish which they have taken.

From British drift or pleistocene beds. *Mus. Parkinson.*

568^l. A vertical longitudinal section of a corresponding upper molar of an Indian Elephant for comparison with No. 568. The crown of this tooth presents the same complicated interblending of the layers of dentine, enamel and cement ; but the lamellar divisions of the crown, which give rise to that structure, are thicker, shorter and fewer in number. The Mammoth's tooth in an antero-posterior extent of five inches includes twelve plates ; the Elephant's tooth has only ten plates in the same extent. The greater thickness of the softer constituents of the plates, viz. the dentine and cement, in the Elephant's tooth, indicates that the Mammoth, which had a greater proportion of the enamel in its grinders, subsisted on a coarser description of vegetable food than do the existing Elephants of the tropics.

569. The upper half of a horizontal section of a large inferior grinder of the Mammoth, wanting a few of the anterior plates. The cut surface of the tooth, which is eleven inches in antero-posterior diameter, includes fifteen plates, the posterior ones being the thickest.

From the drift or pleistocene of Brentford.

Presented by Sir Jos. Banks, Bart., P.R.S.

570. The lower half of the same molar tooth. At this part of the section the lamellæ are expanded in the middle, which gives them a rhomboidal form in the transverse section.

From the drift or pleistocene of Brentford.

Presented by Sir Joseph Banks, Bart., P.R.S.

571. A molar tooth of the right side of the lower jaw of the Mammoth, displaying the outer crust composed of the third constituent of the tooth or the cement, which is partially decomposed and detached from the dental plates.

The abraded surface of the crown measures seven inches and a half in length, and three inches and a half in greatest breadth, and shows the margins of nineteen of the vertical plates.

From the pleistocene sand near Bridport, Dorsetshire.

Presented by H. B. Way, Esq.

572. The corresponding molar of the left ramus of the lower jaw of the same Mammoth, in which the partially decomposed state of the tooth demonstrates the constituent substances, and especially the cement, in the same favourable manner.

From the pleistocene sand near Bridport, Dorsetshire.

Presented by H. B. Way, Esq.

573. Portions of two of the lamellar divisions of the crown of the molar of a Mammoth, with the intervening layers of the enamel and cement. The fractured surface of the dentine shows the course of the dentinal tubes to the naked eye, and the centres from which they radiate to the surface of each of the terminal mammillæ are continued down to the base of the plate.

From the fresh-water pleistocene beds of Grays, Essex.

Presented by Prof. Owen.

574. A single plate of the molar of a Mammoth from which a great part of the cement has been removed, showing the vertically grooved and ridged surface of the enamel; each ridge is impressed by a fine groove.

Locality unrecorded.

Presented by Sir Everard Home, Bart, F.R.S.

575. Three large and some smaller fragments of a large molar of the Mammoth; showing in many parts the direction of the tubular fibres of the dentine.

Locality unrecorded.

Hunterian.

576. The lower molar of the Mammoth, wanting some of the anterior plates. The main part of the crown, which is six inches and a half in length, exhibits the summits of twelve plates; the primitive form of these plates is well shown in the posterior part of the tooth. Their summits are each divided into three mammillary processes, the marginal ones bending obliquely inwards and forwards towards the middle one, which is itself subdivided into two or three smaller protuberances. The successive abrasion of the summits of these primary and secondary divisions of the plates gives rise to the variety of form in the exposed summits of the plates of the posterior half of the grinding surface of the tooth. The external cement has been decomposed and lost. The lower surface of the tooth is excavated by a broad pulp-channel, not yet inclosed by the formation of fangs.

Locality unrecorded.

Hunterian.

577. The posterior portion of an upper molar of the Mammoth, in which the three constituents of the tooth are well displayed by their difference of colour: the dentine being of a dark brown, the enamel bluish black, and the cement of almost its natural yellowish white colour.

From the pleistocene beds or till at Walton, in Essex.

Presented by Sir William Blizard, F.R.S.

578. A considerable portion of the incompletely formed crown of a molar of a large Mammoth, partly resolved by decomposition of the cement, or third substance, into its constituent plates.

Locality unrecorded.

Hunterian.

579. A portion of a molar of a Mammoth similarly decomposed, but with a greater degree of carbonization of the animal matter of the tooth. The disposition of the calcigerous tubes of the dentine is beautifully shown in some parts of this specimen.

Locality unrecorded.

Hunterian.

580. An upper molar of the Mammoth, from which some of the anterior plates have been detached by decomposition ; these exhibit the three vertical lines from which the dentinal tubes radiate.

From the pleistocene beds forming the brick-earth of Grays, in Essex.

Mus. Parkinson.

581. A fragment of one of the upper molars of the Mammoth.

Locality unrecorded.

Hunterian.

582. A portion of the anterior part of the molar of a Mammoth, with the base of the fangs. A great part of both the dentine and cement of the crown has been decomposed and removed, leaving the longitudinally plicated laminæ of the enamel.

Locality unrecorded.

Hunterian.

Growth and Succession.

583. A fragment of the left superior maxillary bone of a young Mammoth, including a small anterior molar, the second in the order of development, and part of the socket of the third molar. The grinding surface of the molar exhibits seven transverse plates, the first two being worn down to their common connecting base, and the last having the summits of four mammillary divisions abraded.

From the drift or pleistocene beds at Ilford, in Essex.

Presented by John Gibson, Esq., F.G.S.

584. An upper molar of a young Mammoth ; the crown is divided into eight plates, five of which have come into use ; the length of the crown is three inches, its breadth one inch and a half ; the three posterior plates have become detached.

By analogy with the Indian Elephant, this molar, like the preceding, must be the second in order of succession.

Locality unrecorded.

Hunterian.

585. An upper molar of a young Mammoth, which had come into use a short period before death. In the abraded portion of the crown, which measures one inch and a half in length, the summits of six transverse ridges

are displayed; the entire tooth includes twelve plates. This molar is the third in order of succession.

From the drift or pleistocene beds at Hinton, Somersetshire.

Hunterian.

585¹. A corresponding upper molar of a young Asiatic Elephant: it is of equal breadth, but greater length, and includes eleven lamellar divisions of the crown, five of which have come into use.

Hunterian.

586. A portion of the left ramus of the lower jaw of the Mammoth with one molar complete and part of another, which had not come into use. The grinding surface of the anterior molar, which is five inches in length, includes the summits of fourteen plates: the posterior of these presents the abraded tips of seven mammillary processes; the next plate in advance is worn down to three divisions, the middle being much broader than the two lateral ones; the three plates in advance of this have the three divisions of more equal breadth; they are blended together into one transverse depression in the anterior lamella. The base of the tooth is divided into five fangs, most of which are bifid. This molar is the fourth in the order of succession. The remains of the socket show the antero-posterior extent of the fifth molar, of which only seven of the anterior divisions of the crown are preserved, connected together by the cement.

From the pleistocene formations near the Ohio, North America.

Purchased.

587. The posterior worn-down extremity of the fifth upper molar of the Mammoth; the transverse plates are almost continuous along their middle rhomboidal dilatations.

From the drift or pleistocene beds of Cambridge.

Purchased.

588. The entire sixth upper molar of apparently the same Mammoth. The grinding surface of the crown, which is eight inches three lines in length, exposes the summits of fifteen transverse plates, the two anterior ones being worn down to their common uniting base.

From the drift or pleistocene beds of Cambridge.

Purchased.

589. The inferior molar of the right side of the lower jaw of a Mammoth. It exhibits the most complete state in which the actions of mastication permit so large a grinder to be seen; the anterior division of the crown not being quite worn down to the fang, and the last or hindmost plate being just on the point of coming into use. The whole length of the tooth is thirteen inches: the total number of lamellar divisions of the crown seventeen, of which the summits of fourteen are abraded in a grinding surface of nine inches extent. The greatest breadth of this surface is two inches and a half. The first three fangs supporting the common dentinal base of the anterior lamellæ are well developed.

This tooth would have been succeeded by one of the size of No. 567, which it resembles in the proportion of breadth to length, in the thickness and relative number of coronal lamellæ, and in the festooning of the enamel. It approaches much nearer the character of the molars of the Indian Elephant than it does those of the thin-plated variety of the grinders of the Mammoth, as Nos. 614 and 617. From these it differs not only in the less numerous and thicker plates, but likewise in the thicker coat of external cement which hides the lateral interspaces of the coronal plates; and in having the fangs developed from the whole base of the tooth, even from the posterior plate, the summit of the middle mammillary process of which has just begun to be abraded. The inner border of the grinding surface of No. 571 is convex, while in the present molar it is concave; this difference depends, however, upon the amount of attrition, for it is obvious that the inner border of the present specimen would become convex if it were worn down one inch lower than it is. From the lower molar of the Indian Elephant the present tooth of the Mammoth differs in the more equable length of the coronal plates, which, in the Elephant, by their more progressive elongation, give a triangular figure to the side view of the crown: it differs also in the greater length of the grinding surface, which includes two more plates, although these are not thinner, and are of less breadth, contrary to the usual character assigned to the Mammoth.

From British drift or pleistocene beds.

Mus. Parkinson.

590. An upper molar of a Mammoth, much worn by mastication. The

grinding surface, which is six inches in length, presents fourteen plates, but the anterior ones have been worn away and the common supporting base of the dentine is there exposed: the posterior and largest fang is considerably elongated: the external cement is partially decomposed and separated from the lamelliform divisions of the crown.

Locality unrecorded.

Hunterian.

591. A lower molar of a Mammoth, much worn by mastication. The anterior plates and the fang supporting them are both gone; four or five of the succeeding plates are worn down to their common uniting base of dentine, and the undulating course of the enamel is there shown; the eight remaining distinct lamellar processes are much bent transversely, with the concavity directed backwards: the whole of the crown here remaining is supported by a long, compressed triangular fang.

Locality unrecorded.

Hunterian.

592. The lower molar of a Mammoth, much worn by mastication. The common dentinal base of four or five of the transverse plates of the anterior part of the grinding surface is exposed. The hinder plates are bent transversely with their concavity directed backwards. The large posterior conical fang offers the degree of development which accompanies the abraded state of the crown; it is longitudinally grooved at the sides, the grooves corresponding with the intervals of the plates above; it is also traversed by parallel transverse grooves and ridges.

Locality unrecorded.

Hunterian.

593. A lower molar of a Mammoth, much worn by mastication. The whole of the enamel has been abraded from the anterior part of the grinding surface, which presents a smooth concavity of ivory, unfit for the attrition of coarse vegetable substances; at the back part of the tooth some irregular transverse ridges formed by the inferior extremities of the descending folds of the enamel still remain. The base of the tooth is prolonged into a compressed obtuse conical fang.

From the upper tertiary formations of Ohio, North America.

Purchased.

- 593¹. A corresponding molar of an Indian Elephant in a similar state of attrition.

Purchased.

594. The posterior extremity of a shed molar of a Mammoth with the crown worn down to the common dentinal base and the fang removed by absorption.

From the fresh-water pleistocene beds of Grays, Essex.

Presented by Wickham Flower, Esq., F.G.S.

595. One of the slender elongated anterior fangs of a much-worn molar of a Mammoth.

Locality unrecorded.

Hunterian.

Varieties.

596. An upper molar of a Mammoth. The grinding surface, which is five inches and a half in length, exhibits the summits of nine transverse plates; but of these only the two anterior ones have the apical mammillæ worn down into a continuous transverse depression. In the four succeeding plates three nearly equal mammillæ are abraded; in the antepenultimate plate the abraded apices of four mammillary processes are seen, two of which belong to the middle process; in the penultimate plate five mammillæ are shown. The contrast between this and the molar tooth in No. 620, which in an antero-posterior extent of five inches of the working surface of the crown displays thirteen plates, is very remarkable.

From British drift or pleistocene beds.

Mus. Parkinson.

597. A portion of an upper molar of a Mammoth, including three lamellar divisions of the crown in an antero-posterior extent of two inches, its breadth being three inches. The abraded surface of the plates presents a slight but gradual expansion from the ends to the middle; and the enamel is much thinner than in the foregoing specimen.

From British drift or pleistocene beds.

Mus. Parkinson.

598. A portion of an upper molar of a Mammoth, having similar characters to those of the preceding specimen. The external cement is of great thickness.

From drift or pleistocene beds in Staffordshire.

Mus. Parkinson.

599. The lower molar of a Mammoth which had recently cut the gum. The grinding surface, which is four inches in length, presents eight plates; the two anterior ones show the worn summits of two mammillary divi-

sions; the third plate is single, but only reaches two-thirds across the surface, there being probably a mammillary process underneath the thick coat of cement which covers the surface exterior to it; the three posterior plates present three mammillary processes, the middle one of much greater transverse extent than the marginal mammillæ; in the posterior plate only the three divisions of the middle mammillary process are exposed. In this molar the plicated enamel is as thin, and the cement as thick, as in the preceding specimens, which appear, with the present, to have belonged to the same Mammoth or variety of Mammoth.

From drift or pleistocene beds in Staffordshire. *Mus. Parkinson.*

Mr. Parkinson, from whose collection this tooth was acquired, by purchase, has figured its grinding surface in his 'Organic Remains,' vol. iii. pl. xx. fig. 6; and he believed the specimen to differ from every other Mammoth's molar that had come to his knowledge, "in the great thickness of the plates, the smoothness of the sides of the line of enamel, and the appearance of the digitated part of the plates even in the anterior part of the tooth." The festooned disposition of the enamel, though slighter than usual, is clearly manifested in the anterior lamellæ. The specimen is the posterior part of a large grinder; the superior thickness of the plates arises from the circumstance of the posterior plates being shorter than the anterior ones; these thick plates are more deeply cleft on their digitated summits, are longer and advance further forward upon the grinding surface of the molar before they are worn down to their common base. This molar has the characters of the thick-plated variety exaggerated, with a deeper division of the plates into the mammilloid or digital processes. It manifests the more constant and characteristic modifications of the grinding teeth of the *Elephas primigenius*, in its great relative breadth, and, notwithstanding their thickness, in the number of the plates (nine) which have been exposed by attrition.

600. The upper molar of a Mammoth: the grinding surface, which is six inches and a half in length, includes twenty lamellæ; four mammillary processes are abraded in the posterior plate; the two lateral ones are blended together on one side in each of the two plates next in advance. In the number and thinness of the plates this tooth resembles that of the

American species of Mammoth ; it was found fifteen feet deep in a stone quarry near Welsbourn, Warwicksire, and is the tooth noticed in the work on 'Organic Remains,' vol. iii. p. 345. *Mus. Parkinson.*

601. A lower grinder of a Mammoth. In six inches extent of the abraded crown there are ten transverse plates ; all these are dilated at the middle part of their exposed margins so as nearly to touch one another, and the remaining interspaces are narrower and contain less cement than the molars of the Indian Elephant ; the entire molar consists of seventeen transverse plates.

From the pleistoeene brick-earth of Grays, in Essex. *Hunterian.*

602. An upper molar of a Mammoth, with the crown cleft into fourteen plates in an antero-posterior extent of eleven inches. This grinder has been slightly abraded by mastication at the anterior angle only, all the rest of the tooth is invested by the thick outer coat of cement : it was dug out of the brick-earth in the village of Grays in Essex, upwards of thirty feet below the surface, and weighed eleven pounds : a few bones of the Mammoth were found scattered about at a little distance from the tooth. It agrees in character with the preceding Hunterian specimen ; and in the smaller number and greater thickness of its coronal plates as compared with the molars of the American Mammoth it corresponds with that of Siberia, which makes a near approach to the existing Asiatic Elephant in the modification of its molar teeth. *Purchased.*

603. A portion of the back part of a large molar of a Mammoth, including five of the lamellar divisions of the crown in an antero-posterior extent of one inch ten lines, the breadth of the plates being three inches.

Locality unrecorded. *Mus. Parkinson.*

604. The posterior part of a large molar of a Mammoth, including six of the lamellar divisions of the crown in an antero-posterior extent of two inches six lines, the breadth of the plates being two inches five lines.

Locality unrecorded. *Hunterian.*

605. An upper molar of a Mammoth. It is seven inches in antero-posterior diameter, and includes sixteen plates, of which nine have come into use,

and from the posterior ones, the tips of the three mammillary processes have been abraded: the surfaces are gradually blended together by attrition towards the fore-part of the tooth, until the margin of the plate presents a continuous transverse depression.

Locality unrecorded.

Mus. Parkinson.

606. A lower molar of a Mammoth. The grinding surface, which is six inches in length, includes ten transverse plates; the two posterior ones exhibit the abraded summits of five mammillary processes; the three middle of which are blended into one in the next two plates in advance, and this is blended with the marginal lamellæ in the remaining plates; the enamel is beautifully plicated in this specimen as in Nos. 566, 567 and 569. The thick outer cement is longitudinally fissured at the projecting margin of each transverse plate, and its surface is minutely wrinkled.

Locality unrecorded.

Mus. Parkinson.

607. The anterior part of an upper molar of a Mammoth. The abraded surface of the crown, which measures three inches and a half in length, displays eight transverse plates; the fourth presenting the summits of the three principal divisions worn down to the same breadth; in the fifth plate the middle division is broader than the two marginal ones; in the seventh and eighth plate two of the mammillary eminences have their summits abraded.

From the drift of Halston Field near Stratford-on-Avon, Warwickshire.

Hunterian.

608. A lower molar of a Mammoth: it is nine inches long, and contains thirteen plates: the grinding surface, which is seven inches in length, exhibits the summits of eleven plates, the enamel is strongly plicated.

Locality unrecorded.

Mus. Parkinson.

609. The lower molar of a Mammoth: it is eight inches long, and contains twelve plates: the grinding surface of the crown measures seven inches, and exhibits the summits of eleven transverse plates. These differ from the plates in the corresponding molar of the Asiatic Elephant, in being more gradually dilated towards the centre, from which the large middle mammilloid process is continued in the unworn grinders; it also differs in

the larger proportion of cement which fills the interspaces of the plates, and the enamel is much less strongly plicated; in this latter character it varies remarkably from the preceding specimen.

Locality unrecorded.

Hunterian.

610. A right upper molar of a Mammoth, wanting a few lamellæ from either extremity. The grinding surface, which is six inches in length, presents the summits of thirteen transverse plates; the primitive form of these component lamellæ is well displayed at the posterior part of the grinder; their free margins are divided into three processes, the middle one much longer and broader than the lateral ones, the apex of the middle process is itself subdivided into smaller mammillæ; in some of the plates one of the lateral processes inclines forwards towards the interspace dividing it from the next plate, by which an alternating disposition of the folds of enamel is presented, when their apices are worn down and before the abrasion has extended to the common uniting base.

Locality unrecorded.

Hunterian.

611. A left upper molar of probably the same Mammoth. The grinding surface, which is six inches and a half in length, includes fourteen plates. These are thin and broad, very slightly dilated near the middle, as in the preceding specimen.

Locality unrecorded.

Hunterian.

612. A left upper molar of a Mammoth: it is nine inches long, and includes twenty-five plates, fifteen of which had come into use. The lateral divisions of the summits of the transverse plates have been unequally inclined forwards as in the preceding specimens, occasioning in the posterior part of the tooth, where they have not been worn down to their common uniting lamellar base, alternating lateral folds of enamel.

From the bed of the Thames.

Mus. Parkinson.

613. The remnant of a nearly worn-out molar of a Mammoth, the crown of which has been abraded by mastication to the common uniting dentinal base of the anterior lamellæ, and in which only the lateral half of the

bases of the plates remain at the posterior part of the crown. The remains of the crown are supported by a long, broad, compressed, slightly curved fang, which is solid to near its apex.

In the Mammoth's grinder the clefts that separate the plates are deeper at the sides than at the middle of the notch, hence the ridges of enamel in a much-worn molar are confined to the outer and inner side of the grinding surface, which is traversed along the middle by a continuous tract of dentine. The outer layer of enamel which covers the dentine below the origin of the plates or transverse lamellar processes is reflected back from the supporting median base of the dentine upon the opposite side of the lateral cleft, bends round the outer margin of the remaining base of the plate, and is continued into the next fissure, and so on. When the ridge of this sinuous coat of enamel is exposed by friction as in the present specimen, it describes a continuous undulating line.

Mr. Parkinson, who has figured the grinding surface of both this* and the preceding specimen †, observes with regard to the latter, No. 612, "The surface of this specimen varies considerably from the recent as well as from the common fossil teeth, in the form and arrangement of its plates. This tooth, which I purchased at the sale of Rackstraw's Museum, was described in the Catalogue as having been taken up with ballast from the bottom of the Thames.

"Of the variation which takes place in the form and arrangement of the plates in this tooth, it is very difficult to give a description. In the recent teeth, and in the common fossil teeth, the plates are continued straight across the tooth, the enamel being disposed in a long elliptical line, in which the osseous part of the ivory is included. Hence by the abstraction of the surrounding crusta petrosa, as we have already seen frequently is the case with the fossil teeth, the tooth falls to pieces, and each flat plate is found separated. But in the specimen which has been just examined, an irregularity may be observed in the third anterior row of the plates, where the two digitated processes of a plate passing over little more than half the width of the tooth, are interposed between the second and fourth plate, and thrust a portion of the latter plate rather

* Organic Remains, vol. iii. pl. xx. fig. vii.

† Ib. pl. xx. fig. v.

aside. It is an extension of this peculiarity of form, which in part characterizes the present tooth, since very few of the plates of which it is formed pass directly across: leaving it difficult to say how the ossous part is disposed.

“But the most characteristic peculiarity of this tooth is the continuity of many of its plates, and the remarkable dædalian line in which the enamel is disposed. This occurs most particularly in a space in the anterior part of the surface. Here one deeply undulating line of enamel forms the parietals of one wide and deeply indented compages of ossous plates. It is very evident that this tooth could not, upon the decomposition of the crista petrosa taking place, divide, in this part, into detached flat plates, as in the teeth of the recent and of the common species of fossil Elephants. This structure is also observable in the fossil tooth from Wellsbourn (No. 616), which has been already noticed.

“This extraordinary structure also exists in the curious and interesting specimen, plate xx. fig. 7 (No. 613). This tooth, with the locality of which I am unacquainted, having purchased it at the sale of Mr. Foster’s Collection, is one which must have been on the point of being excluded from its alveolus, the plates on its fore part being entirely worn away, and of those of the posterior some very shallow portions only remaining. These however are sufficient to show that the plates in this tooth were formed and arranged in a similar mode with those of the preceding tooth.” . . . “This specimen is particularly interesting from the circumstance of its showing that this particular modification of the arrangement of the enamel takes place in the part of the tooth nearest to the root, as the other specimens, that from Wellsbourn, and that whose surface is represented, plate xx. fig. 5, show that it exists in the crown of the tooth. From this peculiarity of structure being found to exist in three different specimens, I conceive that it cannot be regarded as an accidental difference: and from the considerable difference which exists between this arrangement of the enamel and that which occurs in the teeth of the living species, and of the common fossil species, I trust it will be admitted as being likely to be one of the characteristics of a species which has not yet been remarked.”

Hereupon it may first be observed, with regard to the specimens Nos. 612 and 613, that the continuous undulating line of enamel exists only at that part of the crown which is worn down to the common dentinal base, and that this is first exposed along the middle tract of the grinding surface in consequence of the greater depth of the transverse fissures at the margins than at the middle of the coronal plates. Secondly, it follows from the structure of the molars Nos. 562 and 563, that the coronal plates would not necessarily become detached after decomposition of the cement in the completely-formed grinders of either the ordinary Mammoth or existing Elephants: the idea of the separation of the coronal plates, as a necessary consequence of decomposition of the cement, could be entertained only on the view of the grinder being composed of a number of denticules attached together by the cement alone. Such separation, however, takes place only in incompletely developed molar teeth, the lamelliform divisions of the crown being held together independently of the cement as soon as the calcification of the dentinal pulp has completed their uniting base.

Without this knowledge of the mode of development of these complex teeth, of the essential nature of the coronal plates, and their liability to varying inflections, the appearances upon the grinding surface, which are actually due to such variations and to different degrees of attrition, might be viewed as characters of distinct species of Mammoth.

614. The lower molar of a Mammoth: the grinding surface of the crown is seven inches in extent, and displays the summits of eighteen transverse plates; the first and second of which have been worn away to their common dentinal base: the penultimate plate displays four detached mamillary processes, and the two next plates in advance show four dilatations with alternate constrictions. This is a good example of the thin-plated variety of the Mammoth's grinder.

Locality unrecorded.

Mus. Parkinson.

615. The right upper molar of a Mammoth, twelve inches in length, and with the crown divided into twenty-six transverse plates: the summits of seventeen of these are exposed upon the grinding surface of the crown,

which is seven inches and a half in length. Two small fangs are developed from the anterior extremity of the tooth: the common pulp cavity of the ten posterior plates is widely open.

From the tertiary deposits on the banks of the Ohio, North America.

Hunterian.

616. The upper molar of a Mammoth. The grinding surface, which is nine inches in length, exhibits seventeen lamellæ, the dentinal plates having on one side been abraded to their common connecting base: the reflexion of the enamel is shown round the bottom of the entering fissure, and it presents accordingly the undulating or Dædalian disposition noticed in Nos. 612 and 613.

From the drift or pleistocene at Wellsbourn.

Mus. Parkinson.

617. A lower molar of a Mammoth. The grinding surface, which is four inches and a half in length, presents eleven plates; the interspaces containing the cement being broader than the plates of dentine and enamel, which are very slightly dilated in the middle. The coronal plates are worn down to near their common base, and a long fang has been developed from this part of the tooth.

From the tertiary deposits of the banks of the Ohio, North America.

Purchased.

618. A lower molar of a Mammoth. The crown is more abraded than in the preceding specimen, and the grinding surface in a longitudinal extent of four inches displays the summits of eight transverse plates.

From the tertiary deposits of the Ohio, North America.

Purchased.

619. The upper molar, wanting one or two of the anterior plates, of a Mammoth from Siberia. The abraded summit of this tooth is six inches long, and presents eleven transverse plates; they are thicker than in the American Mammoth, and are relatively fewer in number; but, in proportion to their breadth, they are thinner than in the Asiatic Elephant, and are closer together; there is consequently a less proportion of cement in the grinding surface of the crown, and a greater proportion of dentine and

enamel ; but the enamel in the Siberian Mammoth, though more plicated than in the American one, is less so than in the Asiatic Elephant : in an antero-posterior extent of six inches of the grinding surface of the Asiatic Elephant's grinder, selected for comparison with the present specimen, there are ten transverse plates, the greatest breadth of that surface being two inches nine lines, whilst in the present Mammoth's tooth it is three inches and a half.

From the drift or pleistocene beds of Siberia.

Hunterian.

The principal variety to which the molars of the extinct Elephant or Mammoth were subject, is demonstrated by the foregoing series to be in the number of the transverse clefts of the crown, and consequently in the number and thickness of the component plates. The various degrees of this variety have been differently interpreted by different Palæontologists. Parkinson, Fischer, Goldfuss, Nesti and Von Meyer have deduced therefrom some of the characters for the eight distinct species of Mammoth which they suppose to have formerly roamed over the temperate latitudes of Europe and Asia : the differences in the structure of the Mammoth's molars observed by Cuvier were regarded by him as individual varieties.

We find, in regard to the number and thickness of the coronal plates, that the variations are more numerous, as the average number of the plates characterizing the molar teeth of acknowledged distinct species of Elephant is greater.

Thus, in the African Elephant, in which the lozenge-shaped plates are always much fewer and thicker than are the flattened ones in the Indian species, the variation, which can be detected in any number of their grinders, is very slight. In the Asiatic Elephant, which, besides the difference in the shape of the plates, has always thinner and more numerous plates than the African one, a greater amount of variation in both these characters obtains ; but it is always necessary to bear in mind the caution which Cuvier recommended to Camper, that a large molar of an old Elephant is not to be compared with a small molar of a young one in reference to their variety, or otherwise there will appear to be a much

greater discrepancy in the thickness of the plates than really exists in the species ; and the like caution is still more requisite in the comparison of the molars of the Mammoth (*Elephas primigenius*), which having normally more numerous and thinner plates than in the existing Asiatic Elephant, presents a much greater range of variety. That such variety is characteristic, and depends upon the complete structure, of a particular part of the enduring remains of the Mammoth, may be inferred from the absence of any corresponding difference in the bones of the Mammoth that have hitherto been found, all of which indicate but one species. And this conclusion harmonizes with the laws of the geographical distribution of the existing species of Elephant. Throughout the whole continent of Africa but one species of Elephant has been recognised. A second species of Elephant ranges over the southern parts of Asia and a large adjacent island ; and the results of extensive and minute observations of this species, whilst they make known some well-marked varieties, as the Mooknah, the Dauntelah, &c., founded on modification of the teeth, establish the unity of species to which those varieties belong.

Jaws and teeth in situ.

620. A portion of the upper jaw of the Mammoth, including the bony palate and a molar tooth on each side : the summits of all the transverse plates are exposed by abrasion, and the surface of the crown, which is five inches in length, exposes thirteen of them ; the grinding surface is very nearly flat. The remains of the socket of the smaller anterior molar, which has been shed, are visible on each side. From the anterior margin of this socket to that of the tusk measures three inches three lines ; the anterior interspace of the two molars is two inches three lines ; the breadth of the palate at their posterior extremities is four inches ; the palate is relatively wider and more concave than in the *Mastodon elephantoides*. On comparing these molars with the corresponding ones of nearly the same size in the Asiatic Elephant, the first difference observable is the fewer number and larger size of the transverse plates in the recent Elephant, the grinding surface, in a length of six inches, presenting the summits of ten plates ; they are narrower in proportion to the

length or antero-posterior diameter of the molar, are thicker in proportion to the intervening spaces, and the quantity of cement is therefore smaller, the enamel is also more strongly plicated.

From the tertiary formations of Ohio, North America.

Purchased.

621. A portion of the upper jaw of a Mammoth, with the molar of the right side *in situ*, and part of the sockets of the tusks: the antero-posterior extent of the grinding surface of the molar is nine inches, and the common dentinal base of the transverse plates is exposed by attrition to an extent of nearly two inches at the anterior part of the grinder; in an extent of seven inches of the succeeding part of the grinding surface, the summits of thirteen plates are exposed. If this specimen be compared with the *Mastodon elephantoides*, the palate will be seen to be much more deeply excavated, and the diastema between the molar and tusk of much greater depth in the Mammoth.

From the tertiary deposits of the Ohio, North America.

Purchased.

622. The symphysis and part of the right ramus of the lower jaw of a Mammoth, with one of the molars *in situ*. The summits of all the transverse ridges are exposed by attrition, and of these the crown, in a length of five inches, exhibits thirteen. The margin of the jaw anterior to this tooth descends, as in the Elephant, obliquely downwards to a pointed and narrow symphysis; the anterior outlet of the dental canal is two inches below the beginning of this declivity. This tooth, as compared with the corresponding one in the Asiatic Elephant, is broader in proportion to its antero-posterior extent, especially at the two extremities; in the Elephant's tooth compared with it, the abraded surface of the crown, which is five inches in extent, shows the summits of eleven transverse plates, and manifests the same differences in the less breadth of the tooth, the narrower interspaces of the plates, and the more plicated disposition of the enamel, which have been noticed in the description of the upper molar, No. 567.

From the tertiary formations of the Ohio, North America.

Purchased.

623. A portion of the right ramus of the lower jaw of a Mammoth ; containing the socket of a large grinder and the remains of a smaller one ; the large socket is divided into a small anterior compartment for the corresponding anterior fang, and into a large cavity containing the principal base of the molar.

Locality unrecorded.

Mus. Parkinson.

624. Part of the left ramus of the lower jaw of the same Mammoth, showing a socket of similar size and shape.

Locality unrecorded.

Mus. Parkinson.

625. The symphysis of the lower jaw of the Mammoth. The relative breadth of the suprasymphysial channel is less in this specimen of the American Mammoth than in the English specimens with which it has been compared.

From the tertiary deposits of the Ohio, North America.

Purchased.

Tusks.

626. The right tusk of a (male ?) Mammoth. It measures ten feet two inches in length, and twenty-one inches in circumference at its base, and is characterized by the degree and direction of its double curvature.

From the tertiary formations of the Ohio, North America.

Purchased.

627. The right tusk of a (female ?) Mammoth : it presents the same double curvature as the preceding specimen, which resembles that of the tusks of the great Mammoth in the Museum at St. Petersburg from the icy cliff at the mouth of the Lena in Siberia ; but the present tusk measures only five feet in length, and eleven inches in circumference at the thickest part, and two feet four inches across the chord of its curve.

From the drift or diluvium of Cambridge.

Purchased.

628. A plaster cast of a mass of the conical layers of the ivory of a decomposing tusk of a (male ?) Mammoth, measuring twenty-two inches round the base, and twenty inches from the base to the point of the detached

cone. The original of this specimen is in the Museum at Moscow, and has been figured and described under the name of "Dens Crocodili seu Ichthyosauri Maximi."

Presented by R. I. Murchison, Esq., P.G.S., &c.

629. A small model of the tusk of a (male?) Mammoth, which measured nine feet, ten inches along the convexity of the double curvature, and twenty-nine inches at its largest circumference near the base.

The original was disinterred from a brick-field near Kingsland.

Presented by William Clift, Esq., F.R.S.

630. A section of the base of the tusk of the Mammoth, in a state of decomposition.

From British drift or pleistocene beds.

Hunterian.

631. A portion of the tusk of a Mammoth.

Locality unrecorded.

Mus. Brookes.

632. A portion of the base of the tusk of a large Mammoth, much decomposed.

From British drift or pleistocene beds.

Hunterian.

633. Portions of the outer basal lamellæ of the tusk of a Mammoth.

From the drift or pleistocene beds of Flintshire.

Hunterian.

- 633¹. The outer basal lamellæ of the tusk of apparently a recent Elephant: the outer coat or cement is entire; the dentine is in a state of decomposition.

The specimen was placed by Hunter by the side of the preceding specimen apparently to illustrate its nature.

Hunterian.

634. A fragment of a tusk of the Mammoth.

Locality unrecorded.

Hunterian.

635. A tusk of a young Mammoth broken into four pieces, with a cast of its pulp-cavity in the clay matrix.

The structure of the ivory, as visible to the naked eye, is well demonstrated in this specimen.

From British drift or pleistocene beds.

Hunterian.

636. The right tusk of a young, or female, Mammoth.
From the tertiary beds of the Ohio. *Purchased.*
637. The extremity of the right tusk of a Mammoth.
From the tertiary beds of the Ohio. *Purchased.*
638. The half of a transverse section of the tusk of a Mammoth.
Locality unrecorded. *Hunterian.*

Bones of the Trunk and Extremities.

639. The atlas of a Mammoth (*Elephas primigenius*).
Locality unrecorded. *Hunterian.*
- 639'. The atlas of an Elephant (*Elephas indicus*). This vertebra, in both the recent and extinct Elephants, presents the character of the obtuse rough or flattened under surface of the body, by which it is distinguished from the atlas of the *Mastodon*.
Locality unrecorded. *Hunterian.*
640. The body of an anterior dorsal vertebra of a young Mammoth.
Locality unrecorded. *Hunterian.*
641. A dorsal vertebra, with the spinous process broken off, of a Mammoth.
Locality unrecorded. *Hunterian.*
642. A posterior dorsal vertebra of a Mammoth.
From the pleistocene brick-earth at Ilford, Essex; the bone was discovered twenty-two feet below the surface.
Presented by John Gibson, Esq.
643. A fragment of the spine of the scapula of the Mammoth.
From the pleistocene freshwater deposits at Walton in Essex.
Presented by Dr. Wollaston, F.R.S.
644. A fragment of the head of the humerus of a Mammoth.
From the pleistocene beds at Bridport in Dorsetshire.
Presented by the Earl of Essex to Sir Joseph Banks, and, by the hands of Sir Everard Home, to the Museum of the College.

645. Part of the shaft of the humerus of a Mammoth.

From the pleistocene beds at Bridport.

Presented by H. B. Way, Esq. to Sir Joseph Banks, and by Sir Joseph to the College.

The circumstances attending the discovery of this and other fossils of the Mammoth by Mr. Way are thus described in a letter from that gentleman to Sir Joseph Banks :—“My house being near a high cliff of yellow earth or clay with stones intermixed, and which cliff is perpendicular on the side next the sea, large portions of which frequently slip down; one having occurred very lately in the part of the cliff nearest me, as I had lately enclosed a pretty large plot of deep sand in front of my house next the sea, and which I was desirous of getting into some kind of cultivation, I availed myself of the opportunity of carting away a considerable quantity of the yellow sand or clay from the slip above mentioned, in doing which my men dug out and brought me three bones, very different from any I have seen, and in an apparently, to me, very unusual state. The cliff from which they must have fallen is at that place I judge about forty feet high, and, as the soil that was on the surface before it fell remains still on the top of what has fallen down, and these bones were found about half-way up in the heap, I should suppose the bones must have come from a part of the cliff about half-way from the surface to the shore.”

Dated Bridport Harbour, Sept. 16, 1809.

646. A fragment of the compact wall of the shaft of the humerus of a Mammoth.

From the drift of Germany.

Hunterian.

647. The inner condyle and part of the shaft of the right humerus of a Mammoth.

From the pleistocene beds forming the cliffs near Mannington, Suffolk.

“From Dr. Woodward’s collection.”

Hunterian.

648. The left os cuneiforme of a Mammoth: it is noted in the manuscript Catalogue as being “half petrified.”

Locality unrecorded.

Hunterian.

649. A plaster cast of the right os cuneiforme of a Mammoth. It measures three inches nine lines in the vertical diameter of its anterior surface: the corresponding part in the os cuneiforme of a large Asiatic Elephant measuring one inch nine lines.

From the brick-earth at Grays, Essex.

Presented by W. Ball, Esq., F.G.S.

650. A plaster cast of the right os magnum of the same Mammoth.

Presented by W. Ball, Esq., F.G.S.

651. A plaster cast of the right os cuneiforme of the same Mammoth.

Presented by W. Ball, Esq., F.G.S.

652. A plaster cast of the second metacarpal bone of the right fore-foot of the same Mammoth, wanting the distal extremity.

Presented by W. Ball, Esq., F.G.S.

653. A plaster cast of the third or middle metacarpal bone of the same fore-foot of the Mammoth.

Presented by W. Ball, Esq., F.G.S.

654. A plaster cast of a fragment of a rib of the same Mammoth.

Presented by W. Ball, Esq., F.G.S.

655. The second metacarpal bone of the left fore-foot of a Mammoth. It is heavily impregnated with iron.

Locality unrecorded.

Hunterian.

656. The fourth metacarpal bone of the left fore-foot of the Mammoth.

From the pleistocene or latest tertiary deposits of the Ohio, North America.

Purchased.

657. The head of the femur, in the state of an epiphysis, of a young, but nearly full-grown Mammoth. It measures seven inches across the detached surface.

From the freshwater deposits of the cliffs at Walton, in Essex.

Presented by Sir Wm. Blizard, F.R.S.

658. Three fragments of the femur of a Mammoth.

From the pleistocene beds of the cliffs at Bridport.

Presented by H. B. Way, Esq. to Sir Joseph Banks, and, by the hands of Sir Everard Home, to the College.

The following note from Sir Joseph Banks to Sir Everard Home relates to these specimens, and to Nos. 571 and 572.

“ My dear Sir,

“ Soho Square, March 28th, 1810.

“ With this you will receive another fragment of an Elephant’s bone from Bridport, with the yellow sand in which it was imbedded adhering to it. How singular, that the skeleton of the animal should have been torn to pieces before it was lodged ; even the teeth wrenched out of the jaws, and yet many bones and parts of bones remain near the same spot !

“ Yours always,

“ JOSEPH BANKS.”

659. The proximal half of the right tibia of a proboscidian animal, with the articular surfaces mutilated : it resembles the tibia of the Indian Elephant more than that of the Mastodon, and probably belongs to the Mammoth (*Elephas primigenius*). The bone is petrified, and a reddish calcareous earth adheres to its posterior surface.

Locality unrecorded.

Hunterian.

660. The right tibia, wanting the proximal end, of a Mammoth.

From the drift in the neighbourhood of Moscow.

Purchased.

661. Fragments of bones of a Mammoth ; they are noted in the manuscript Catalogue as being “ calcined, or in the bony state,” that is, absorbent from the loss of the animal matter.

Locality unrecorded.

Hunterian.

662. Portions of decomposed vegetable matter, found between layers of brick-earth which contained bones of the Mammoth.

From Ilford, Essex.

Presented by William Thompson, Esq.

Genus *Mastodon*.*Mastodon elephantoides*.

663. A mutilated and petrified cranium of the *Mastodon elephantoides*, Clift. The posterior fractured surface displays the large cancelli which are there developed, as in the Elephant.

From the tertiary formations of the Sub-Himalayan district, India.

Presented by Walter Ewer, Esq., F.R.S.

664. A portion of the upper jaw of the *Mastodon elephantoides*, Clift. It includes four molars and the intervening bony palate: the grinding surface of the anterior molar on each side measures seven inches and a half, and exhibits seven transverse ridges and a posterior talon; this has not yet been abraded; the mammillary summits of the last ridge have just begun to be worn; the dentine is exposed in all the anterior ridges, and to a greater depth as they advance forwards, the common base of the two anterior ridges being there exposed. The posterior grinder, three of the ridges of which have emerged from the socket, is situated almost at right angles with the antecedent tooth, the summits of the ridges being directed backwards; it must describe the same degree of revolution in attaining the position requisite for the office of mastication, as the molars do in the Elephant: the anterior interspace of the right and left molars is one inch and a half across, the bony palate gradually widens, as it extends backwards, to about four inches; its posterior margin is excavated by a rectangular notch rounded off at the apex. The palate presents a deep transverse excavation, two inches in antero-posterior extent, between the grinder and the socket of the tusk; a portion of this socket, with a fragment of the base of the tusk, is preserved on the left side. This part of the tusk descends almost vertically at right angles with the plane of the anterior molar, and with a very slight bend, which is convex towards that molar. On the right side of this instructive fragment the anterior smaller

fang, and the posterior large-grooved conical fang of the grinder in use, are exposed.

From the tertiary formations of the Sub-Himalayan district, India.

Purchased.

665. The right ramus of the lower jaw of the *Mastodon elephantoides*, with the symphysial extremity and the coronoid and condyloid processes broken off; in the first molar the grinding surface is five inches in antero-posterior extent, and presents five transverse ridges, the abraded depressions of which are slightly wider at the middle than at the outer and inner extremities; the thick enameled ridges with which they are surrounded are plicated; of the second molar tooth eight of the transverse ridges have emerged from the socket, but only the first four have begun to be abraded, and in not any of them are the numerous mammillary eminences entirely worn away. Compared with the lower jaw of the African Elephant, the antero-posterior extent of the ascending ramus in the Elephantoid Mastodon is much greater than that of the molar series anterior to it; the depression on the outer surface of the ascending ramus is greater, and the convex prominence of the bone below it is broader and more horizontal; the ridge which extends from the anterior part of the molar series downwards to the symphysis is broader and more obtuse in the Mastodon; the lower convex surface of the ramus is likewise considerably broader, but the general resemblance with the lower jaw of the Elephant is much greater in this species of Mastodon than in the *Mastodon giganteus*. From the *Mastodon giganteus* the *Mastodon elephantoides* differs in the rounding off of the angle of the jaw, in the diminished length of the horizontal ramus, in the greater depth of that part anterior to the first molar, and in the much smaller concavity on the inner side of the ramus; the circumference of the ramus anterior to the coronoid process is twenty-two inches in the *Mastodon elephantoides* and nineteen inches in the *Mastodon giganteus*; the length of the jaw in the *Mastodon elephantoides* being twenty-seven inches, and that of the *Mastodon giganteus* compared with it being twenty-four inches.

From the tertiary formations of the Sub-Himalayan district of India.

Purchased.

666. A plaster cast of a considerable portion of the left ramus of the lower jaw of the *Mastodon elephantoides*, with the socket of a worn-out molar, and the entire crown of the succeeding molar displayed. Of this tooth only the two anterior divisions of the crown have come into use, and of these the tips of four of the mammillary terminations of the second plate are alone abraded; the summits of the succeeding transverse conical eminences are terminated by five or six small and nearly equal conical obtuse mammillæ. The length of the tooth is twelve inches, the number of transverse mammillated eminences is ten inches.

See the Geological Transactions, Second Series, vol. 2. Part III.

Presented by the Geological Society of London.

667. Part of the left ramus of the lower jaw of the *Mastodon elephantoides*, containing two molar teeth: the grinding surface of the first is six inches in length, and presents eight transverse ridges; of the second molar the mammillated summits of five ridges have emerged from the sockets, but none of these have been abraded by mastication; the direction of the fibres of the thick enamel on the posterior fractured surface of this tooth is well shown.

From the tertiary formations of the Sub-Himalayan district of India.

Purchased.

668. A portion of the left ramus of the lower jaw of the *Mastodon elephantoides*, containing a considerable proportion of a molar tooth: the grinding surface shows seven transverse ridges, the mammillary summits of which are worn away in the first two, and more or less abraded in the two following. The pulp-cavity and fang are exposed at the anterior end, and the direction of the fibres of the thick enamel is well displayed at the posterior fractured surface of the tooth.

From the tertiary formations of the Sub-Himalayan district, India.

Presented by the Rev. E. Everest, F.G.S.

669. A considerable part of the right ramus of the lower jaw of a young *Mastodon elephantoides*, with two molar teeth: the crown of the first is divided into seven transverse ridges, the first and second of which are worn down to the common base of dentine, and from the others, with

the exception of the last, the mammillary summits have been abraded. Of the succeeding molar five of the ridges of the crown have emerged from their socket.

From the tertiary formations of the Sub-Himalayan district, India.

Presented by Thomas Bacon, Esq.

670. A part of the left ramus of the same jaw, with the corresponding teeth ; a part is broken off from the posterior tooth, showing the depth of the transverse fissures of the grinding surface.

From the same formation and locality.

Presented by Thomas Bacon, Esq.

671. A portion of the left ramus of the lower jaw of the *Mastodon elephantoides*, with a molar tooth *in situ*. It is sawn through vertically in the axis of the jaw, and shows the depth and thickness of the folds of enamel that line the interspaces of the ridges at the posterior part of the tooth ; these have been obliterated by attrition at the anterior part of the tooth, where the common base of dentine is exposed. A long and thick fang is developed from the posterior part of the tooth.

From the tertiary formations of the Sub-Himalayan district, India.

Presented by the Rev. E. Everest, F.G.S.

672. A portion of the crown of a molar tooth of the *Mastodon elephantoides*, on one of the fractured surfaces of which the course of the dentinal tubes is indicated.

From the tertiary formations of the Sub-Himalayan district, India.

Presented by the Rev. E. Everest, F.G.S.

673. One of the transverse ridges of a large upper molar of the *Mastodon elephantoides*, broken across vertically, and beautifully displaying the course of the enamel-fibres on the fractured surfaces.

From the tertiary formations of the Sub-Himalayan district, at Nahn.

Presented by H. Clark, Esq, Surgeon H.E.I.C.

674. A portion of the lower jaw with the corresponding part of a molar tooth

of the *Mastodon elephantoides*, including four transverse plates in different stages of abrasion, the mammillary summits being nearly entire in the posterior one. On one side of the fractured tooth the plications of the descending folds of enamel are shown, the other side displays the general course of the dentinal tubes.

From the tertiary formations of the Sub-Himalayan district, India.

Presented by the Rev. E. Everest, F.G.S.

675. A fragment of the right ramus of the lower jaw of the *Mastodon elephantoides*. The posterior fractured surface exposes the pulp-cavity of the molar tooth, which is become filled with rhomboidal crystals of spar or carbonate of lime.

From the tertiary formations of the Sub-Himalayan district, India.

Presented by the Rev. E. Everest, F.G.S.

676. A plaster cast of a portion of an upper molar of the *Mastodon elephantoides*: the grinding surface, which is six inches in length, exhibits five ridges; the three posterior of which are terminated by six small obtuse mammillæ in the same transverse line.

From the tertiary deposits of the left bank of the Irawadi, Ava.

Presented by the Geological Society of London.

677. A plaster cast of an upper molar of a younger individual of the *Mastodon elephantoides*; the crown of which supports six transverse ridges, and a posterior talon or tuberculate ridge.

From the tertiary deposits of the left bank of the Irawadi, Ava.

Presented by the Geological Society of London.

678. A segment of the tusk of the *Mastodon elephantoides*.

From the tertiary deposits of the Sub-Himalayan district, India.

Presented by the Rev. E. Everest, F.G.S.

679. The body of a lumbar vertebra of the *Mastodon elephantoides*.

From the tertiary formations of the Sub-Himalayan district, India.

Presented by the Rev. E. Everest, F.G.S.

680. The proximal end of the left femur of the *Mastodon elephantoides*: the great trochanter is broken off.

From the tertiary deposits of the Sub-Himalayan district, India.

Presented by the Rev. E. Everest, F.G.S.

681. The distal end of the right femur of the *Mastodon elephantoides*.

From the tertiary deposits of the Sub-Himalayan district, India.

Presented by the Rev. E. Everest, F.G.S.

682. The distal end of the left femur of the *Mastodon elephantoides*.

From the tertiary deposits of the Sub-Himalayan district, India.

Presented by the Rev. E. Everest, F.G.S.

683. The right astragalus of the *Mastodon elephantoides*.

From the tertiary deposits of the Sub-Himalayan district, India.

Presented by the Rev. E. Everest, F.G.S.

684. The os trapezoides of the right fore-foot of a young Proboscidian, probably the *Mastodon elephantoides*.

From the tertiary deposits of the Sub-Himalayan district, India.

Presented by Thomas Bacon, Esq.

685. The second metacarpal bone of the left fore-foot of a young Proboscidian, probably the *Mastodon elephantoides*: both extremities of the bone are in the condition of epiphyses. This specimen and No. 684 were discovered in continuity with the lower jaw of the young *Mastodon elephantoides*, Nos. 668 and 669.

Presented by Thomas Bacon, Esq.

Mastodon latidens.

686. A plaster cast of a portion of the right ramus of the upper jaw of the *Mastodon latidens*, Clift. The grinding surface, which is nine inches and a half in length, presents nine ridges, of which the first two have been blended together by attrition, the third presents a single transverse cavity, the fourth is divided into two mammillæ; in the fifth the subdivisions of the two principal mammillæ have begun to be abraded, the re-

maining eminences present three, four, or five mammillæ; those of the hindermost division being arranged in an oval form.

From the tertiary deposits of the left bank of the Irawadi, Ava.

Presented by the Geological Society of London.

687. A plaster cast of part of the upper molar tooth of the right side of the *Mastodon latidens*.

From the tertiary deposits of the left bank of the Irawadi, Ava.

Presented by the Geological Society of London.

688. A plaster cast of part of the right ramus of the lower jaw of the *Mastodon latidens*. The grinding surface, which is nine inches in length, presents six transverse eminences; the first two have been blended together by attrition, the third is worn to a continuous transverse depression, the fourth and fifth are each divided into two equal mammillary eminences, the sixth terminates by four obtuse mammillæ, three in the same transverse line and the fourth behind.

From the tertiary strata on the left bank of the Irawadi, Ava.

Presented by the Geological Society of London.

689. A fragment of a larger molar tooth of the *Mastodon latidens*, presenting two unworn ridges, one divided into four, the other into three obtuse mammillæ.

From the tertiary strata near the left bank of the Irawadi, Ava.

Presented by the Geological Society of London.

Mastodon angustidens.

690. A fragment including the middle part of the left ramus of the lower jaw of the *Mastodon angustidens*, Cuv. (*Mast. Sivalensis*, Cautley). It exhibits the crown of an entire grinder, apparently the penultimate one, and a small portion of the succeeding grinder: the penultimate grinder supports five transverse ridges, the first four being divided into two principal mammillæ directed obliquely and alternately, with their internal angles wedged into the opposite interspaces; the first transverse ridge has been preceded by a narrow talon; the posterior and smallest ridge is

divided into two small and transversely situated mammillæ. The depth of the jaw anterior to this molar is not materially increased to form the symphysis, and the upper margin extends forwards in front of the molar in the same horizontal line with the plane of the socket, instead of sinking down to join the symphysis, in which respect the present species of *Mastodon* resembles the *Mast. giganteus*, and differs from the *Mast. elephantoides* and from the Elephant.

From the tertiary formations of the Sub-Himalayan district, India.

Purchased.

691. A plaster cast of a portion of the crown of the left lower molar of the *Mastodon angustidens*, Cuv. It corresponds precisely in size, form and alternate disposition of the mammillary processes, with the preceding specimen, and presents the smallest posterior ridge and the three pairs in advance; the anterior pair and part of the inner side of the tooth having been broken off.

From the older pliocene tertiary fluvio-marine Crag of Norfolk.

Presented by Robert Fitch, Esq., F.G.S.

692. A plaster cast of the crown of a left lower molar of the *Mastodon angustidens*, Cuv. The posterior talon is relatively smaller than in No. 691, but the larger pairs of mammillary processes present the same alternate arrangement as in the preceding specimens.

From the miocene tertiary formations of Baltimore.

Presented by Dr. Richard Harlan.

693. A plaster cast of a portion of the right upper jaw of a very young *Mastodon angustidens*, Cuv. (*Mast. longirostris*, Kaup), showing the two deciduous molars which are shed and replaced vertically; and the second permanent molar, or that which succeeds the first of the series that comes into place vertically: both these are subsequently shed by horizontal displacement, like the molars of the Elephant.

From the miocene tertiary formations at Epplesheim in Rhine Hessa.

Presented by Dr. Kaup.

694. A plaster cast of the palatal and alveolar portions of the maxillary bone

of the *Mastodon angustidens* (*Mast. longirostris*, Kaup), with the antepenultimate molar of the right side, and the penultimate molar of both sides of the jaw. All the mastoid tubercles of the crown are worn away to the common base of the dentine in the antepenultimate molar; and the summits of most of the tubercles in the penultimate molars have suffered abrasion. The crown of both these teeth supports four pairs of tubercles, and an anterior and posterior tuberculate talon.

From the mioene tertiary formations at Epplesheim in Rhine Hessa.

Presented by Dr. Kaup.

695. A plaster cast of a considerable proportion of the superior maxillary bone of the *Mastodon angustidens* (*Mast. longirostris*, Kaup). It exhibits the whole of the palate, and the molar series as it is reduced by age. This series consists in the present example of two teeth on each side, viz. the penultimate molar and last molar. The penultimate, which is the fourth of the permanent series, supports four pairs of mastoid tubercles all of which have had their enamelled summits removed by mastication, and the two anterior pairs are worn down to their common dentinal base. The last molar has five pairs of tubercles, and a large posterior talon which is subdivided into three or four small tubercles. The summits of the anterior tubercles only have been worn by mastication. This tooth is supported by two principal roots, the anterior of which is the smallest, and supports the two anterior pairs of cusps; the posterior root, which sustains the rest of the crown, becomes subdivided in the progress of age.

From the miocene tertiary formations at Epplesheim in Rhine Hessa.

Presented by Dr. Kaup.

696. A plaster cast of the crown of an incompletely formed molar of the *Mastodon angustidens*, Cuvier (*Mast. longirostris*, Kaup). It presents four transverse eminences, each divided into two principal and nearly equal mammillæ; the fourth or smaller eminence has a posterior talon, and there is a smaller obtuse eminence in each of the three intervals of the large ridges.

From the mioene tertiary formations at Epplesheim in Rhine Hessa.

Presented by Dr. Kaup.

697. A cast of a molar tooth, the third (second of the permanent series) of the lower jaw of the *Mastodon angustidens*, Cuv. Its crown supports three pairs of mastoid tubercles, an anterior basal ridge and a posterior bituberculate talon; a small tubercle is developed at the middle of each of the valleys between the larger pairs of tubercles. The original of this cast was transmitted from Saxony by Professor Hugo of Göttingen to Bernard de Jussieu. Cuvier has figured it in the 'Ossemens Fossiles,' 1821, tom. i. pl. 11. fig. 11, and has noticed it at p. 267, as being apparently too small to be referred to any of the species of Mastodon which he had described. He points out its resemblance to the molars of the *Mastodon giganteus*, which is figured in 'Pl. III. fig. 4, Grande Mastodonte': these are, however, the fourth and the fifth molar, or the third and fourth of the permanent series, and the tooth of the *Mastodon giganteus*, which corresponds in size with the present specimen, is the last of the three molars *in situ* in the jaw of the younger animal with tusks, No. 705, the first and second of these molars forming the deciduous series and being replaced vertically by a single molar, which is the first of the permanent series. *Presented by Baron Cuvier.*

698. A cast of the fourth molar tooth (the third of the permanent series) of the lower jaw of the *Mastodon angustidens*, Cuv. The original was discovered in the tertiary strata of Simorre. Reaumur has figured a fragment of a fossil molar of the same Mastodon in illustration of his memoir on the Turquoise mines at Simorre in the 'Mémoires de l'Acad. des Sciences, 1715.' Daubenton notices the fossil Mastodont molars from the same locality as "dents pétrifiés ayant des rapports avec celles de l'Hippopotame." Cuvier, who first determined the true nature and relations of these fossil teeth of the Mastodon, commences his description of them with the original of the present cast, *loc. cit.*, p. 255. pl. 1. fig. 4. The crown supported three pairs of mastoid tubercles (not six pairs, as Cuvier describes, evidently by an error of press): those of the first pair have been worn down by mastication to their common dentinal base, which presents the form of a quadrilobate disc: a line of enamel still divides the contiguous bases of the second pair of tubercles: a little of the enamel has been worn from the summits of the posterior pair; these are

succeeded by a bituberculate talon. The crown is supported by two fangs, the posterior one being the largest and supporting the two posterior pairs of tubercles and the talon. *Presented by Baron Cuvier.*

699. The crown of the antepenultimate grinder of the upper jaw of a *Mastodon angustidens*.

From the miocene tertiary formations of the South of France.

Purchased.

700. A portion of the molar tooth of the *Mastodon angustidens*: it has been much worn, and the uniting base of the two anterior ridges is exposed by their abrasion.

Locality unrecorded.

Hunterian.

701. A fragment of a molar tooth of the *Mastodon angustidens*.

Locality unrecorded.

Hunterian.

702. A fragment of a molar tooth of the *Mastodon angustidens*.

Locality unrecorded.

Hunterian.

703. The posterior part of a molar tooth of the *Mastodon angustidens*.

Locality unrecorded.

Hunterian.

704. The cast of a portion of the tusk of the lower jaw of the *Mastodon angustidens* (*Mastodon longirostris*, Kaup).

From the miocene tertiary formations at Epplesheim.

Presented by the Earl of Enniskillen.

Mastodon Andium.

705. A fragment of an upper molar tooth of the *Mastodon Andium*, Humboldt. The molars of these species are characterized by the strong and irregular plications of the extremely thick enamel.

From the recent tertiary deposits of South America.

Presented by Charles Darwin, Esq., F.R.S.

706. A portion of a molar tooth of the *Mastodon Andium*, Humboldt: it supports two transverse ridges, each divided into two principal mammillæ, which are again subdivided into smaller mammillæ: these when

worn down, as in the foregoing specimen, occasion the complex disposition of the thick enamel which is displayed in that specimen.

From the recent tertiary formations at Tarija, Upper Peru.

Purchased.

707. A fragment of the right ramus of the upper jaw with the base of a molar tooth of the *Mastodon Andium*, Humboldt.

From the recent tertiary formations at Tarija, Upper Peru.

Purchased.

708. The proximal half of the right femur of the *Mastodon Andium*, Humboldt. It differs from that of the *Mastodon giganteus* in the greater relative development of the trochanter major, which rises higher and projects further outwards: this occasions a more concave outline of the external border of the upper half of the femur in the *Mastodon Andium*: the anterior surface of the bone likewise slopes more towards that border, and the posterior surface of the upper part of the femur is flatter in the *Mastodon Andium* than in the *Mast. giganteus*.

From the recent tertiary deposits at Tarija, Upper Peru.

Purchased.

709. The distal end of the left femur of the *Mastodon Andium* (?). It differs from the corresponding part of the *Mast. giganteus* in the more angular depression for the patella, in the greater length of the rotular surface in proportion to its breadth, and in the well-marked ridge by which that surface overhangs, or is divided from, the inter-condyloid depression; this depression, also, is relatively wider than in the *Mast. giganteus*.

From the tertiary deposits in the province of Buenos Ayres.

Presented by Charles Darwin, Esq., F.R.S.

710. The distal half of the right tibia, broken lengthwise, of the *Mastodon Andium*, Humboldt.

From the recent tertiary deposits at Tarija, Upper Peru.

Purchased.

Mastodon giganteus.

Growth and Succession of the Teeth.

711. A portion of the upper jaw of a young *Mastodon giganteus*, Cuv., with

the third and fourth molars of the left side *in situ*: the crowns of each of these teeth are divided into three transverse ridges: the bony palate is flatter than in the *Mastodon elephantoides* or the Mammoth.

From the tertiary beds of the Ohio.

Hunterian.

712. A cast of the lower jaw, wanting the ascending rami, of a young *Mastodon giganteus*: it demonstrates the sockets of the two incisive tusks which characterize the immature state of the gigantic individuals of the present extinct genus: one of the tusks is retained *in situ*. The three anterior molars and part of the socket of the fourth molar are exhibited on the left side; on the right side the second, third, and fourth molars are preserved *in situ*, together with the remains of the socket of the first molar, which has been shed. Some of the changes in the dentition of the Mastodon, as the teeth are successively developed from before backwards, are well illustrated in this specimen, and the analogy of the process to the more remarkable changes in the dentition of the existing Proboscidian Pachyderms may be clearly traced. The first molar, for example, is very small and simple, as compared with the succeeding teeth; its crown supports only two transverse eminences with a small internal and posterior talon; viewed detached it might be mistaken for a tooth of the Tapir: the second molar has nearly double the size, but differs in the form of the crown, chiefly through the greater proportional development of the posterior talon: the third molar, besides being quadruple the dimensions of the first, supports three transverse eminences, and a narrow ridge at both the anterior and posterior parts of the base: each of the transverse ridges is slightly divided by a median cleft into two mammillary eminences: the summits of both those of the anterior ridge and of the outer one in the middle ridge have been abraded. The fourth molar presents an increase of size, but not quite to the same degree, as compared with the third molar: its crown has the same shape and structure as in the third molar; only the first transverse eminence has emerged from the bony socket, which is situated on the inner side of the base of the coronoid process, a part of which is preserved on the right ramus.

The original of this specimen is preserved in Peel's Museum, New York, and was first described by Dr. Godman as a type of a new genus

of Proboscidiens to which he gave the name of *Tetracaulodon*, in the third volume of the New Series of the 'Transactions of the American Philosophical Society': it has likewise been described and figured by Dr. Isaac Hays in the fourth volume of the same work, plate 26, fig. 1 and 2.

From the tertiary deposits about twelve miles from Newburg, in Orange County, New York.

Presented by the Geological Society of London.

713. The symphysis of the lower jaw of a young *Mastodon giganteus*, showing the remains of the alveoli of the two deciduous incisors.

From the tertiary deposits of the Ohio, North America.

Purchased.

714. A portion of the right ramus of the lower jaw of the *Mastodon giganteus*, containing the penultimate and antepenultimate molars of the socket of the last large molar. The crown of the antepenultimate molar supports three transverse ridges, and has an anterior and posterior narrow transverse minutely tuberculate talon; each of the ridges is divided into two mammilloid processes, the innermost of which are the longest; the crown is supported by two fangs, the anterior one broad but compressed from behind forwards, and with the extremity bifid and bent backwards; the posterior and thicker fang is deeply grooved on each side. The penultimate molar has almost the same general form and structure as the preceding, but is of larger size; there is a small tubercle at the outer end of the bottom of the cavity between each of the transverse ridges: the concavity of the ascending ramus of the jaw displays the upper and lower divisions of the great dental canal, besides the intervening socket of the last molar.

From the tertiary deposits of Ohio.

Purchased.

715. A portion of the left ramus of the lower jaw of the *Mastodon giganteus*, including the symphysis and the penultimate and last molar teeth *in situ*: in the last molar the large posterior talon is developed into a fifth ridge, divided into two mammillary processes and having a small quadrituberculate talon behind it: part of the three principal fangs are exposed, the

extremity of the large posterior one is curved forwards, in one of its divisions, from which the cement has been detached : the equidistant parallel transverse ridges are remarkably well defined.

From the tertiary deposits of Missouri.

Purchased.

716. The right ramus of the lower jaw of the *Mastodon giganteus*, showing the socket of the antepenultimate molar and the penultimate and last molars *in situ* : the former presents three principal transverse ridges, each divided into two mammillary processes, and an anterior and posterior talon ; the last molar presents five transverse ridges with an anterior talon and posterior tubercle ; three of the ridges have emerged from the socket : the dental canal commences by a depression on the inner side of the neck of the condyle, and becomes wider and deeper as it descends obliquely forwards to its bifurcation in the substance of the jaw, six inches behind the posterior alveolus : its principal anterior outlet is on the outside of the jaw about two inches below the anterior alveolus ; a smaller continuation of the canal may be observed in the fractured surface of the symphysis, indicating the position of the socket of the lower incisor, which is lost in the female *Mastodon*, as she advances to maturity.

The lower jaw of the *Mastodon giganteus* differs from that of the *Mast. elephantoides* and of the Elephant in the smaller antero-posterior extent of the ascending ramus and the greater height of the condyle, in the more marked angle between the horizontal and ascending ramus, in the straighter contour and much greater depth of the posterior margin leading from the condyle to the angle, in the more compressed form, the greater length and the less convex sides of the horizontal ramus, in its less degree of breadth inferiorly, in the greater vertical extent of the symphysis, and in the angle formed between it and the upper margin of the jaw anterior to the molar teeth, which margin does not descend to join the symphysis.

From the tertiary deposits of Ohio.

Purchased.

717. A portion of the right ramus of the lower jaw of the *Mastodon giganteus*, showing the sockets of the penultimate and last molar tooth.

From the tertiary deposits of Ohio.

Purchased.

718. The left ramus of the lower jaw of the *Mastodon giganteus*, with part of the symphysis, the socket of the penultimate molar, and the last molar *in situ*. The crown of this tooth supports four transverse ridges, and a posterior talon divided into four small tubercles in the same transverse line.

The great dental canal presents three distinct outlets, one below the socket of the penultimate grinder, the second of equal size near the symphysis, and a third smaller one below and in advance of the preceding: there is no trace of the socket of an incisor. This specimen exhibits a variety of the last molar in its diminished size, as well as in the smaller number of eminences on the grinding surface.

From the tertiary deposits of Ohio.

Purchased.

719. The left ramus of the lower jaw of *Mastodon giganteus*, with the last molar *in situ* and the socket of the penultimate one. The crown of the last molar supports five tuberculate ridges and a small posterior tuberculate talon: this molar resembles in structure the last of No. 715; but is of smaller size, indicating a variety in this respect, in the *Mastodon giganteus*: there are two anterior outlets of the great dental canal, one beneath the socket of the penultimate molar, the other of smaller size near the symphysis, which exhibits no trace of the alveolus of the incisive tusk.

From the tertiary deposits of Ohio.

Purchased.

720. A portion of the right ramus of the lower jaw of the *Mastodon giganteus*, including the socket of the penultimate molar and the last molar *in situ*: the crown of this tooth supports four normal bimammillary transverse ridges; a large posterior bituberculate talon, which might be regarded as a fifth ridge; and a smaller talon behind this: there is a small tubercle at the outer angle of the interspace of each of the transverse ridges, and the third tubercle of the large posterior talon represents one of the same series in the interspace between that talon and the fourth normal ridge of the crown. The summits of the outer mammillary processes are worn down lower than those of the inner ones: portions of three of the fangs of this molar are exposed. The absence of an alveolus for the incisor at the symphyseal end of this ramus, indicates it to have belonged to a

female Mastodon. The direction of the ridge circumscribing the insertion of the temporal muscle, shows this to have extended deeper upon the outer part of the ascending ramus than in the younger specimen, No. 715.

From the tertiary deposits of Ohio.

Purchased.

721. A portion of the right ramus of the lower jaw of the *Mastodon giganteus*; with the last molar tooth much worn: it has supported five transverse ridges, the last of which alone retains its mammillary divisions: behind these there is a small tuberculate talon. The common dentinal base of the first and second ridges is exposed by attrition and worn into a smooth and polished cavity. One of the outlets of the dental canal is situated, as usual, below the alveolar border, in advance of the last molar: the large size of the remainder of the canal, which is continued to the fractured end of the symphysis, and its proximity to the inner margin of that part, indicates very strongly the existence of the incisive tusk on this side of the jaw, and that this fragment belonged, therefore, to a male Mastodon.

From the tertiary deposits of Ohio.

Hunterian.

722. The last upper molar of the *Mastodon giganteus*: its crown, which resembles that of the preceding specimen, is supported by two large anterior diverging fangs and a posterior mass divided by deep longitudinal depressions into six lobes or divisions.

From the tertiary deposits of Ohio.

Hunterian.

723. The last upper molar of the *Mastodon giganteus*. The crown supports four transverse ridges and a posterior talon: each of the ridges is divided into two nearly equal mammillæ, and there is a small tubercle at the outer part of each of the three interspaces: the base of the tooth is subdivided into seven fangs.

From the tertiary deposits of Ohio.

Purchased.

724. The last upper molar of the *Mastodon giganteus*; its crown supports five transverse ridges, an anterior basal prominence and a posterior talon: it is supported by a mass, more or less completely subdivided into seven fangs.

From the tertiary deposits of Ohio.

Hunterian.

725. The last upper molar of the *Mastodon giganteus*, in which the three anterior bimammillary ridges of the crown have been abraded by mastication, and the whole of the inner surface of the tooth worn away and polished by some accidental circumstance connected with the stratum in which the tooth was imbedded.

From the tertiary deposits of Ohio.

Purchased.

726. The last molar of the right side of the lower jaw of the *Mastodon giganteus*: the crown supports four transverse ridges with an anterior narrow talon and a posterior broader and trituberculate talon: the crown is supported by three fangs; the anterior one is of great breadth, compressed from before backwards, and slightly curved backwards; the second is the smallest; the third is a large conical mass partially subdivided by the vertical grooves into buttress-like processes, corresponding with the three posterior ridges on the inner side of the crown. A portion of the anterior fang has been removed and the surface polished to show the compact dentine.

From the tertiary deposits of Ohio.

Purchased.

727. A similar but larger lower molar of the *Mastodon giganteus*: the crown supports five transverse ridges and a small posterior trituberculate talon: the ridges decrease in breadth and height as they approach the back part of the molar: they are each divided, as usual, into two mammilloid processes, from which the name of the genus is derived; the bottom of the interspaces of the ridges is occupied by a dense substance of the same dark chocolate colour as the cement which invests the fangs: the anterior fang and a great part of the anterior ridge of the crown which it supports, have been broken off.

From the tertiary deposits of Ohio.

Purchased.

728. The last molar of the right side of the lower jaw of the *Mastodon giganteus*. It has been longitudinally and vertically bisected. The crown supports four transverse ridges and a large posterior talon consisting of one large udder-shaped process and four smaller mammillæ. The cut surface of the tooth shows the thickness of the enamel and the direction of its

fibres : the polished dentine shows principally the lines which represent the margins of the hypothetical lamellæ which seem to be superimposed and to follow the contour of the grinding surface. The outer surface of the fangs has been water-worn or abraded by some movements of the stratum in which the fossil tooth was deposited.

From the tertiary deposits of Ohio.

Purchased.

729. The last molar of the left side of the lower jaw of the *Mastodon giganteus*. The crown supports four transverse ridges and a posterior talon divided into five small transversely disposed mammillæ : the crown is supported by an anterior broad compressed fang, two smaller fangs on the same transverse line, and a thick conical fang supporting the posterior half of the tooth ; the end of one of the smaller fangs is broken off, and the fractured surface exhibits the engine-turned pattern produced by the decussation of opposite curved lines, a character which is so conspicuous in the ivory of the tusks of the proboscidian Pachyderms. The layer of cement which invests the fangs is of great thickness at the angles of their bifurcation.

From the tertiary deposits of Ohio.

Purchased.

730. The last lower molar of the left side of the *Mastodon giganteus* : its crown supports four transverse ridges and a posterior talon, which from its size and division into two transverse mammilloid processes, resembles a fifth transverse ridge, behind it there is a more minute talon divided into three small tubercles ; a part of the thick coronal cement remains at the bottom of the outer side of the interspace between the third and fourth ridges. A longitudinal vertical section has been removed from the first transverse ridge and its supporting fang, and the enamel has been removed from the remaining part of this ridge, as also from the inner tubercle of the third ridge. A part of the cement has been detached from the dentine of the first, second and posterior fangs, showing the parallel transverse indentations on the surface of the dentine.

From the tertiary deposits of Ohio.

Purchased.

731. The posterior half of the last molar of the right side of the lower jaw of the *Mastodon giganteus* : it includes the hinder transverse ridges, a large

trituberculate talon and a cluster of very small mammillæ behind it. The coronal cement fills up the bottom of the cavity between the last transverse plate and the talon; the parallel transverse ridges and indentations of the base of the tooth are very strongly marked on the massive posterior fang, especially at the parts where the cemental coat has been removed; the summit of most of the transverse eminences is impressed with a fine groove; the apex of this fang is divided into three points, the largest of which is curved.

From the tertiary deposits of Ohio.

Purchased.

732. A portion of an inferior molar of the *Mastodon giganteus*; including the two posterior transverse ridges, and a narrow talon: each of the ridges is divided into two mammillæ, each of which is again subdivided into two smaller ones. The ridges are united by a lower oblique ridge.

From the tertiary deposits of Ohio.

Mus. Parkinson.

Stages of Growth of the Molar Teeth.

733. A molar of a young *Mastodon giganteus*, the fourth of the left side, upper jaw, advanced in its formation to near the completion of the crown; the base, in which the indentations indicative of the three fangs have just begun to appear, is a thin shell of dentine bounding a large and widely open pulp-cavity.

From the tertiary deposits of Ohio.

Purchased.

734. The corresponding molar of the right side of apparently the same jaw; with one extremity vertically split off.

From the tertiary deposits of the Ohio.

Purchased.

735. The extremity of the preceding tooth, showing the thickness of the enamel and the direction of the enamel fibres and dentinal tubes.

Purchased.

736. The crown of an incompletely formed molar of the *Mastodon giganteus*: the base is excavated by a large and single cavity, which contained the

pulp; it is bounded by the sharp edge of the shell of dentine that existed at this period of formation, before the development of the fangs.

From the tertiary deposits of Ohio. *Purchased.*

737. The crown of the last molar tooth of the *Mastodon giganteus*, extracted from its alveolus before the commencement of the development of the fangs: it supports four bipartite transverse ridges and a posterior talon supporting three large and three small tubercles. A portion of the first ridge is broken away, but the summit of the remainder is entire, and shows that it had not come into use.

From the tertiary formations of Missouri.

Presented by S. P. Pratt, Esq., F.R.S.

738. A molar of the *Mastodon giganteus* further advanced in its development, the divisions of the fangs beginning to be formed: the base of the tooth is still excavated by a single deep cavity for the lodgment of the pulp.

From the tertiary deposits of Ohio. *Purchased.*

739. The antepenultimate molar, left side, lower jaw of the *Mastodon giganteus*, the crown of which is divided into three transverse ridges, and an anterior and posterior narrow transverse talon; the enamel is abraded from the summits of the mammiloid divisions of the anterior ridge; the enamel has been detached from a great part of the inner side of the crown showing the direction of its fibres: the strong backward curvature of the extremity of the anterior fang gives it an unciform figure.

From the tertiary deposits of Ohio. *Hunterian.*

740. A much-worn molar of the *Mastodon giganteus*, consisting almost entirely of fangs, nearly the whole of the enamelled crown being worn away and excavated into a single cavity with a uniform polished surface of dentine.

From the tertiary deposits of Ohio. *Purchased.*

741. A similar but still more abraded molar of the *Mastodon giganteus*, in which some of the osseous deposition, 'osseo-dentine', of the central cavity of the fangs, forms part of the smooth and polished grinding

surface of the crown: some parts of the margin of the dentine present the curvilinear decussating lines which characterize the ivory of the tusk.

From the tertiary deposits of Ohio.

Purchased.

Tusks.

742. The basal conical lamellæ of the tusk of a proboscidian Pachyderm, probably the *Mastodon giganteus*: the largest circumference of this fragment is sixteen inches, and its contour is slightly elliptical.

From the tertiary formations of Kentucky, North America.

Purchased.

743. The basal part of the tusk of a young or female *Mastodon giganteus*.

From the tertiary formations of Kentucky.

Purchased.

744. The central conical lamellæ of the middle part of the same tusk: the fractured surface at the base of the cone demonstrates very strongly the decussating engine-turned character of true ivory.

From the tertiary formations of Kentucky.

Purchased.

745. The tusk of a young or female *Mastodon giganteus*: it is three feet six inches in length and one foot in basal circumference.

The tusks of the Mastodon differ from those of the Mammoth in the smaller amount of their curvature, which is also much more nearly on the same plane: the direction of the tusks is forwards, upwards and a little outwards.

From the tertiary deposits of Missouri.

Purchased.

746. A portion of the tusk of the *Mastodon giganteus*: the extremity has been unequally worn and polished; the thin exterior coat of cement remains at the opposite side of the extremity: the decussating curvilinear impressions are very strongly marked at the broken ends of the fragment.

From the tertiary formations of Ohio.

Purchased.

747. A portion of the tusk of a proboscidian Pachyderm, probably the *Mastodon giganteus*: one-half has been worn away lengthwise, leaving an imperfectly polished surface; the outer coating of the tusk has been

similarly abraded from the opposite side; all the edges have been rounded off.

From the tertiary formations of Ohio. *Purchased.*

748. A fragment of the tusk of a proboscidian Pachyderm, probably the *Mastodon giganteus*, one side of which has been similarly abraded and polished.

From the tertiary formations of Ohio. *Purchased.*

749. A portion of the base of the tusk of a proboscidian Pachyderm, probably the *Mastodon giganteus*, one-half of which has been worn away lengthwise, and the pulp-cavity laid open; the successive conical layers into which the ivory is resolved by decomposition are well shown in this fragment.

The marks of abrasion in this and the two preceding specimens are most probably due to inorganic forces operating after death.

From the tertiary formations of Ohio. *Purchased.*

Bones of the Trunk and Extremities.

750. The atlas of a *Mastodon giganteus*; it differs from that of the Elephant and Mammoth principally by the obtuse conical production of the under part of the body of the vertebra.

From the tertiary formations of Ohio. *Purchased.*

751. The atlas of the *Mastodon giganteus*: both transverse processes are broken off: the inferior protuberance is more obtuse than in the foregoing specimen, but retains sufficient of the distinctive character of the bone as compared with that in the genus *Elephas*.

From the tertiary formations of Ohio. *Purchased.*

752. The vertebra dentata of the *Mastodon giganteus*.

From the tertiary formations of Ohio. *Purchased.*

753. A fourth cervical vertebra of the *Mastodon giganteus*.

From the tertiary formations of Ohio. *Purchased.*

754. A dorsal vertebra of the *Mastodon giganteus*, with the spinous process broken off.
 Locality unrecorded. *Hunterian.*
755. The neural arch, and spine, with the summit broken off, of an anterior dorsal vertebra of the *Mastodon giganteus*: the spine measures in its present mutilated state twenty-one inches in length.
 From the tertiary deposits of Ohio. *Purchased.*
756. The base of the spine of an anterior dorsal vertebra of the *Mastodon giganteus*.
 From the tertiary deposits of Ohio. *Purchased.*
757. A considerable proportion of the os sacrum of the *Mastodon giganteus*.
 From the tertiary deposits of Ohio. *Purchased.*
758. A portion of the anterior extremity of the os sacrum of the *Mastodon giganteus*.
 From the tertiary deposits of Ohio. *Purchased.*
759. A portion of one of the anterior ribs of a large proboscidian Pachyderm, probably the *Mastodon giganteus*.
 From the tertiary deposits of Ohio. *Purchased.*
760. A fragment of an anterior rib of, probably, the *Mastodon giganteus*.
 From the tertiary deposits of Ohio. *Purchased.*
761. A portion of one of the anterior ribs of, probably, the *Mastodon giganteus*.
 From the tertiary deposits of Ohio. *Purchased.*
762. The vertebral extremity of the rib of, probably, the *Mastodon giganteus*: the head of the bone presents two articular surfaces, and there is a third surface upon the tubercle.
 From the tertiary deposits of Ohio. *Purchased.*
763. A portion of a rib of a large proboscidian Pachyderm, probably the *Mastodon giganteus*.
 From the tertiary deposits of the Ohio. *Purchased.*

764. A portion of a rib of, probably, the *Mastodon giganteus*.
From the tertiary deposits of Ohio. *Purchased.*
765. The proximal portion of one of the left posterior vertebral ribs of, probably, the *Mastodon giganteus*.
From the tertiary deposits of Ohio. *Purchased.*
766. A portion of a right posterior rib of, probably, the *Mastodon giganteus*.
From the tertiary deposits, Ohio. *Purchased.*
767. The manubrium sterni of the *Mastodon giganteus*.
From the tertiary formations of the Ohio, North America. *Purchased.*
768. A portion of the head of the left humerus of the *Mastodon giganteus*.
From the tertiary formations of Ohio. *Purchased.*
769. The shaft and distal extremity of the left humerus of the *Mastodon giganteus*: it is thicker in proportion to its length than in the Elephant or Mammoth, the deltoidean ridge is continued lower down, and the fossa above the fore-part of the articular surface is deeper.
From the tertiary formations of Ohio. *Purchased.*
770. The distal end of the left humerus of a *Mastodon giganteus*.
From the tertiary deposits of Ohio. *Purchased.*
771. The right ulna of the *Mastodon giganteus*. It presents the same short and massive proportions as the humerus, and shows that the Mastodon stood lower in proportion to its size than the Elephant or Mammoth.
From the tertiary deposits of Ohio. *Purchased.*
772. The left os cuneiforme of the *Mastodon giganteus*.
From the tertiary formations of Ohio. *Purchased.*
773. The metacarpal bone of the second toe of the right fore-foot of the *Mastodon giganteus*.
From the tertiary formations of Ohio. *Purchased.*

774. The metacarpal bone of the third or middle toe of the right fore-foot of the *Mastodon giganteus*.

From the tertiary formations of Ohio.

Purchased.

775. The metacarpal bone of the fifth or outermost toe of the left fore-foot of the *Mastodon giganteus*; it has formed part of the skeleton of a much larger individual than the foregoing specimens, but, like them, is chiefly remarkable for its great thickness in proportion to its length, as compared with the Elephant: the proportions of the fore-foot being broader and more massive in the Mastodon.

From the tertiary formations of Ohio.

Purchased.

776. A considerable proportion of the right os innominatum of a large Proboscidian Pachyderm, probably the *Mastodon giganteus*. The acetabulum differs from that of the Elephant in the comparative narrowness of the notch leading to the Haversian depression, which is indicated by an almost obsolete groove; the branch of the pubis is also relatively thicker.

From the tertiary formations of Ohio.

Purchased.

777. A considerable proportion of the right os innominatum of a smaller or younger Proboscidian Pachyderm; in which the entry to the Haversian depression is as wide as, and the depression itself somewhat deeper and wider than, in the Elephant; the pubis is relatively stronger.

From the tertiary deposits of the Ohio, North America.

Purchased.

778. The left os innominatum of apparently the same individual Proboscidian, showing the same characters of the acetabulum.

From the tertiary deposits of the Ohio, North America.

Purchased.

779. The left femur of the *Mastodon giganteus*. It is three feet in length, and one foot two inches in circumference at the middle. It differs from the femur of the Elephant and Mammoth in being shorter in proportion to its breadth and thickness, and it is therefore a relatively stronger bone; it is likewise flatter on its posterior surface and the distal condyles are more approximated.

From the femur of the *Mastodon Andium* of South America, the present specimen differs in the minor development of the trochanter major, which neither rises so high nor extends so far out; the outline of the external border of the upper half of the femur is accordingly less concave in the *Mastodon giganteus*: the anterior surface of the upper part of the bone is flatter and does not slope so gradually to the outer margin. The upper border of the neck of the femur is more concave in the *Mastodon giganteus*. The rotular surface is more regularly concave from side to side, and is less distinctly defined at its lower part.

From the tertiary formations of Ohio, North America.

Purchased.

780. The head of the femur, in the state of an epiphysis, of the *Mastodon giganteus*. This shows, as in the Elephant and Mastodon, the absence of the depression indicative of the ligamentum rotundum.

From the tertiary formations of Ohio, North America.

Purchased.

781. The head of the femur, ankylosed to the shaft, of the *Mastodon giganteus*.

From the tertiary formations of Ohio, North America.

Purchased.

782. The condyles of the right femur, ankylosed to the shaft, of the *Mastodon giganteus*.

From the tertiary deposits of Ohio, North America.

Purchased.

783. The distal extremity with the articular condyles of the left femur, in the state of an epiphysis, of the *Mastodon giganteus*. From the size of this specimen as compared with the entire femur, No. 778, it would seem to have belonged to the skeleton of a young male.

From the tertiary formations of Ohio, North America.

Purchased.

784. The right patella of the *Mastodon giganteus*.

From the tertiary formations of Kentucky, North America.

Purchased.

785. A portion of the thick compact wall of the shaft of the femur of a large Proboscidian Pachyderm, probably the *Mastodon giganteus*.
From the tertiary deposits of Kentucky, North America.
Purchased.
786. The right tibia of the *Mastodon giganteus*.
From the tertiary deposits of Kentucky, North America.
Purchased.
787. The left tibia of the *Mastodon giganteus*, apparently from the same individual as the preceding.
From the tertiary deposits of Kentucky, North America.
Purchased.
788. The right tibia of the *Mastodon giganteus*: from the large size of this bone, as compared with the preceding specimens, the individual to which it belonged was probably a male.
From the tertiary formations of Ohio, North America.
Purchased.
789. The left astragalus of the *Mastodon giganteus*.
From the tertiary formations of Ohio, North America.
Purchased.
790. The right os calcis of the *Mastodon giganteus*.
From the tertiary formations of Ohio, North America.
Purchased.

Genus *Dinotherium*.

Most of the following illustrations of the present extraordinary genus of Pachydermal quadrupeds consist of plaster casts of the original fossils in the Museum of Hesse Darmstadt, described and figured by their discoverer, Dr. Kaup.

791. The palatal and alveolar portions of the upper jaw of a young *Dinotherium giganteum*, Kaup, which had perished during the period of the change in the dentition. The first deciduous molar has been shed on each side: the second and third deciduous molars are in place; behind these is the third permanent molar, or the first of the series of true

molars ; the crowns of the two false molars, or the first and second of the permanent series, were found in closed alveoli in the substance of the jaw, above the deciduous molars which they would have displaced and succeeded in the vertical direction. The crown of the second true molar, the fourth or penultimate of the permanent series, was in like manner in progress of completion in a closed alveolus behind the first true molar, which it succeeds horizontally.

The second tooth *in situ*, which is the third or last of the series of deciduous molars, has a crown which is as complex as the true molar behind it, supporting three transverse eminences with an anterior and posterior basal ridge ; it is succeeded, as will be seen in a subsequent specimen, by a permanent tooth, having, as is usually the case with the premolar teeth, a more simple crown than the tooth displaced.

From the miocene tertiary deposits at Epplesheim, Rhine Hessia.

The original specimen is described and figured in Dr. Kaup's 'Description d'Ossements Fossiles de Mammifères du Muséum de Darmstadt,' 1^{re} Cah., pl. 1

Presented by Dr. Kaup.

792. The crown of the first permanent premolar of the left side, which was removed from the closed alveolus in the preceding specimen : it supports two eminences, the outer one slightly and the inner one deeply cleft into two mammillary processes : a basal ridge surrounds all but the outer part of the circumference of the crown. The summits of the eminences are entire and tuberculated.

From the miocene tertiary deposits at Epplesheim.

Presented by Dr. Kaup.

793. The crown of the second permanent premolar of the left side, which was removed from the closed alveolus in the specimen No. 783. Both eminences are more deeply notched than in the first premolar, especially the inner one, which is cleft to the base : the anterior of the mammilloid divisions is also joined by a continuous ridge to the anterior one of the outer eminence. The transverse diameter of this molar exceeds the antero-posterior, and it thus differs considerably both in the configu-

ration of the crown and in its general proportion, from the deciduous molar which it displaces.

From the miocene tertiary deposits at Epplesheim.

Presented by Dr. Kaup.

794. The anterior part of the palatal and alveolar processes of the upper jaw of a mature *Dinotherium giganteum*, with the sockets of the two premolar teeth on each side, and three of the right and the first of the left side *in situ*. These teeth agree in size and shape with the two preceding specimens, but the tuberculate margins of the coronal eminences have been worn away by mastication.

From the miocene tertiary formations at Epplesheim.

The original is figured and described in Dr. Kaup's 'Description d'Ossemens Fossiles du Muséum de Darmstadt,' 1^{re} Cah. pl. 1. a. fig. 2.

Presented by Dr. Kaup.

795. A portion of the alveolar process of the upper jaw of a female *Dinotherium giganteum*, with three true molars *in situ*. The first of these corresponds with its analogue in No. 790, but the tuberculate summits of the three transverse eminences have been worn off.

From the miocene tertiary formations at Epplesheim.

Presented by Dr. Kaup.

796. The left ramus of the lower jaw of the *Dinotherium giganteum*, with the four anterior permanent molar teeth. The third, counting backwards, has the crown divided into three transverse ridges, and corresponds with the first permanent molar in the upper jaw. The symphyseal extremity of the jaw is subcompressed and bent downwards at almost a right angle with the horizontal ramus, and supports two long and strong tusks directed downwards and curved slightly backwards.

From the miocene tertiary deposits at Epplesheim.

The original is figured in Dr. Kaup's 'Ossemens Fossiles du Muséum de Darmstadt,' Add. tab. ii. fig. 1 and 1 a.

Presented by Dr. Kaup.

797. The left ramus and entire symphysis of the lower jaw of the *Dinotherium giganteum*; with the five anterior molar teeth *in situ*, and both tusks in

the deflected symphyseal extremity. The first and second grinding teeth are premolars; the three remaining teeth are true molars, the first having the crown complicated by three transverse eminences, the second and third having two transverse eminences.

From the miocene tertiary deposits of Epplesheim.

The original is figured in Dr. Kaup's 'Ossemens Fossiles du Muséum de Darmstadt,' Add. tab. i. figg. 1, 3 and 4. *Presented by Dr. Kaup.*

798. The left ramus of the lower jaw and the entire symphysis of the *Dinotherium giganteum*; with the two posterior permanent molar teeth, the second and third of the true series. The left deflected tusk is entire; the right tusk has been broken. The dentition shows the animal to which the present magnificent relic had belonged to have been aged, yet the tusks seem larger in proportion to those in Nos. 795 and 796, than would depend upon a difference of age alone, and leads to the suspicion that the present specimen may have belonged to a male, and those with the smaller tusks to female Dinotheres. The present jaw was discovered broken across in front of the first molar, but the two parts were near each other, in the miocene tertiary deposits at Epplesheim. They were originally restored by Dr. Kaup, according to the ordinary analogies, so that the symphysis and the tusks were curved upwards towards the upper jaw, according to the figure given in the 'Ossemens Fossiles du Muséum de Darmstadt,' tab. iv. The subsequent discovery of the original of No. 795 showed that the symphysis and the incisive tusks were bent in the opposite direction, as they are restored in the present specimen, and as they are figured in the work above cited, Add. tab. i. fig. 5.

Presented by Dr. Kaup.

799. The first deciduous molar of the upper jaw of the *Dinotherium giganteum*.

From the miocene tertiary formations at Epplesheim.

Presented by Dr. Kaup.

800. The third deciduous molar, right side, upper jaw, of the *Dinotherium giganteum*, Kaup.

In the original Hunterian Catalogue this specimen is described as "part of a grinder, without the root, consisting of three risings or prominences, of a Hippopotamus." The last grinder in the lower jaw of that animal was doubtless the nearest analogue to the present fossil which Hunter possessed for the purposes of comparison.

Locality unrecorded.

Hunterian.

801. The first superior premolar, or the most anterior of the series of permanent molars, of the *Dinotherium giganteum*.

From the miocene tertiary formations at Epplesheim.

Presented by Dr. Kaup.

802. The second molar of the female *Dinotherium giganteum*.

From the tertiary formations at Epplesheim.

Presented by Dr. Kaup.

803. The second premolar of a young male *Dinotherium giganteum*.

From the tertiary formations at Epplesheim.

Presented by Dr. Kaup.

804. The second superior premolar of the *Dinotherium giganteum*; the crown of which has been much worn by mastication.

From the miocene tertiary formations at Epplesheim. The original of this tooth is described and figured in Dr. Kaup's 'Description d'Ossements Fossiles du Muséum de Darmstadt,' 1^{re} Cah., pl. 2. fig. 4.

Presented by Dr. Kaup.

805. The crown of the third permanent molar of the first of the series of true molars of the upper jaw of the *Dinotherium giganteum*; apparently a large male individual.

From the miocene tertiary formations of Epplesheim.

Presented by Dr. Kaup.

806. The second true molar or penultimate permanent molar of the upper jaw of a large male *Dinotherium giganteum*.

From the miocene tertiary formations at Epplesheim.

Presented by Dr. Kaup.

807. The crown of a similar molar tooth of the gigantic Dinothere, which has

been crushed by some geological force in the stratum in which it was imbedded. The original of this tooth is in the possession of the Earl of Enniskillen.

From the miocene tertiary formations of Epplesheim.

Presented by the Earl of Enniskillen.

808. The third deciduous molar, right side, lower jaw, of the *Dinotherium giganteum*.

From the miocene tertiary formations of Epplesheim.

Presented by Dr. Kaup.

809. The last deciduous molar tooth, left side, lower jaw, of the *Dinotherium giganteum*.

The original was discovered in the miocene tertiary formations at Chevilly in the plain of Beauce, near Orleans, and is described and figured by Cuvier in the 'Ossemens Fossiles,' 1822, tom. ii. pt. 1. p. 171. pl. 4. fig. 5.

Presented by Baron Cuvier.

810. The crown of the third permanent molar of the lower jaw, or the first of the series of true molars, of a young *Dinotherium giganteum*. The base is widely open and the formation of the fangs not commenced.

From the miocene tertiary deposits of Epplesheim.

Presented by Dr. Kaup.

811. The corresponding tooth of a mature *Dinotherium giganteum*; the fangs have been completed and the summits of the three transverse ridges, characteristic of the first true molar, are worn down.

From the miocene tertiary deposits of Epplesheim.

Presented by Dr. Kaup.

812. The crown of the penultimate molar, left side, lower jaw, of the *Dinotherium giganteum*. It closely resembles the preceding, but is rather further advanced in its development.

The original was discovered, six feet deep, in a stratum of miocene tertiary sand at Arbeichan, near Auch, in the Department of Gers. It is described by Cuvier in the 'Ossemens Fossiles,' 1822, tom. ii. pl. 1. p. 166, who says, "Il est presque carré, et n'a que deux collines et un

talon." The cast was presented to the Museum of the College as representing "the superior grinder of the first species of Gigantie Tapir:" and of all existing animals the Tapir is undoubtedly that whose molar teeth most nearly resemble those of the present gigantic extinct Paehy-derm. Cuvier, however, restricts his conclusions within the bounds of the evidence which he then possessed. He writes, "Tout concourt donc jusqu'à présent à rapprocher notre animal des Tapirs ; et tant que nous n'aurons pas la preuve que ces dents incisives et canines ne correspondent pas à celles de ce genre, nous serons autorisés à l'y rapporter. Nous lui conservons donc le nom spécifique de *Tapir gigantesque*, que nous lui avons donné depuis long-temps*." The discovery, by Dr. Kaup, of the entire jaw in which the molars of the supposed gigantic Tapir were associated with the large deflected incisive tusks, and the subsequent discovery of the entire cranium, demonstrated the association of a tapiroid molar dentition with proboscidian modifications, establishing at least a generic distinction ; and the term *Dinotherium*, proposed by Dr. Kaup for the *Tapirus giganteus* of Cuvier, has been universally accepted. Dr. Kaup has shown † that the present molar and No. 813, are both the penultimate true molars of the left ramus of the lower jaw. *Presented by Baron Cuvier.*

813. The crown of the penultimate inferior molar of a young *Dinotherium giganteum*. This tooth was in process of formation when the animal perished, and the development of the fangs had not commenced. The original of the cast is described and figured by Cuvier in the 'Ossemens Fossiles,' tom. ii. pt. 1. p. 166. pl. iv. fig. 3.

Locality unknown ("d'origine inconnue").

Presented by Baron Cuvier.

814. The penultimate inferior molar of a female *Dinotherium giganteum*.

From the miocene tertiary deposits at Epplesheim.

Presented by Dr. Kaup.

815. A section of the last molar, right side, lower jaw, of the *Dinotherium*

* *Loc. cit.*, p. 174.

† Description des Ossemens Fossiles du Muséum de Darmstadt, 1^{re} Cah., p. 9.

giganteum, showing the great thickness of the enamel, and the course of the tubuli of the dentine.

From the miocene tertiary formations at Epplesheim, Hesse Darmstadt. *Presented by Dr. Kaup.*

816. The crown of the last molar tooth of the left side of the lower jaw of the *Dinotherium giganteum*.

From the miocene tertiary formations at Epplesheim, Hesse Darmstadt. *Presented by Dr. Kaup.*

817. The last molar of the left side of the lower jaw of the *Dinotherium giganteum*. The tuberculate summits of the transverse ridges of the crown have been worn away by mastication, and the two long and thick fangs have been completed.

From the miocene tertiary formations at Epplesheim. The original is described and figured in Dr. Kaup's 'Ossemens Fossiles du Muséum de Darmstadt,' 1^{re} Cah., p. 9. pl. 3. fig. 6. *Presented by Dr. Kaup.*

818. The second premolar, right side, upper jaw, of the *Dinotherium Cuvieri*, Kaup. The grinding surface of the crown is modified more completely into the form of two transverse ridges than in the corresponding tooth of the *Dinotherium giganteum*, and the transverse and antero-posterior diameters of the crown are equal.

From the miocene tertiary deposits at Epplesheim.

The original of this cast is mentioned by Dr. Kaup in his 'Description d'Ossemens Fossiles du Muséum de Darmstadt,' 1^{re} Cah., p. 15, and a corresponding molar tooth from the miocene tertiary beds at Carlat-le-Compte, is described and figured by Cuvier in the 'Ossemens Fossiles,' tom. ii. pl. 1. p. 170, pl. 8. fig. 4, and referred to a species allied to the Tapir. *Presented by Dr. Kaup.*

819. A cast of both rami, mutilated, of the lower jaw of the *Dinotherium Cuvieri*, Kaup. The right ramus contains the four posterior molar teeth; the left contains the three posterior molars and the socket of the fourth in advance:

the sockets show that the two fangs were grooved longitudinally down the sides turned towards each other.

Presented by the Professors of the Museum of Natural History, Paris.

820. The posterior portion of the last molar tooth of the *Dinotherium Cuvieri*, Kaup.

From the miocene tertiary strata at Epplesheim.

Presented by Dr. Kaup.

821. The penultimate molar, right side, lower jaw, of the *Dinotherium Cuvieri*, Kaup.

The original was discovered in the miocene tertiary deposits at Chevilly, in the plain of Beauce, near Orleans, and is described and figured by Cuvier, as a molar of his second species of Gigantic Tapir, in the 'Ossemens Fossiles,' 1822, tom. ii. pt. 1. p. 170. pl. iv. fig. 1.

Presented by Baron Cuvier.

Genus *Lophiodon**.

822. The anterior portion of the right ramus of the lower jaw, with the canine and four anterior molars of the *Lophiodon tapiroides*, Cuv. ("Grand Lophiodon de Buchsweiler"). The fourth molar has been displaced and thrown inwards. The first of the three molars in place has two cusps, the three following have each two transverse ridges, with this difference, that in the second and the third the anterior ridge is raised and the posterior one very low: in the fourth the two ridges are equal. The symphysis of the jaw terminates opposite the interspace of the second and third molar.

The original was discovered in a quarry of freshwater calcareous (eocene?) tertiary formation near Buchsweiler in the Department of the Lower Rhine, and is described and figured by Cuvier in the 'Ossemens Fossiles,' 1822, tom. ii. pt. 1. p. 200. pl. 7. fig. 1.

Presented by Baron Cuvier.

823. A portion of the upper jaw with the penultimate and last grinders of the right side of the *Lophiodon tapiroides*, Cuv. These teeth very closely resemble the corresponding ones in the Tapir; but they exceed in size

* *λόφιον* a ridge, *ὀδὸν* a tooth.

those of the Indian species by more than one-fourth, and those of the American Tapir by nearly one-half.

The original was discovered in a quarry of freshwater calcareous (eocene?) tertiary formation near Buchsweiler in the Department of the Lower Rhine, and is described and figured by Cuvier in the 'Ossemens Fossiles,' 1822, tom. ii. pt. 1. p. 206. pl. 7. fig. 3.

Presented by Baron Cuvier.

824. The crown of an incompletely developed superior molar tooth of the *Lophiodon tapiroides*, Cuv. The original is figured in the 'Ossemens Fossiles,' 1822, tom. ii. pt. 1. pl. 1, and is described in the posthumous edition of the same work, 8vo, 1835, as "Germe de dent d'origine inconnue, qui paraît appartenir à la grande espèce de *Lophiodon* de Buchsweiler."

Presented by Baron Cuvier.

825. A cast of the middle part of the left ramus of the lower jaw of a *Lophiodon* with the last three or true molars, and part of the premolar next in advance. The crowns of all these teeth appear to have been worn down by mastication almost to their base, but they have precisely the proportions, and the last molar retains the anterior of the two transverse ridges, which characterize the teeth of the genus *Lophiodon*, Cuv. The last molar tooth likewise possesses the large posterior lobe or talon which distinguishes this tooth in the *Lophiodon* from that of the Tapir. The teeth a little exceed in size those of the *Lophiodon Isselanus* (Grand *Lophiodon* d'Issel), Cuvier, 'Ossemens Fossiles,' ed. 1822, tom. ii. pt. 1. p. 184. pl. 3. fig. 3, the antero-posterior diameter of the last molar in that species being one inch eight lines and in the present fossil one inch ten lines. But the depth of the jaw below the middle of the last molar in the present fossil is three inches; whilst that in the *Lophiodon Isselanus*, in the figure cited, is scarcely two inches, and Cuvier expressly states (p. 186) that it surpasses in depth the corresponding part of the jaw of the *Lophiodon medius* (pl. 3. fig. 1.), which has molar teeth of the same size as in the *Loph. Isselanus*. I propose, therefore, to name the American extinct species of Pachyderm indicated by the present fossil,

Lophiodon bathygnathus, or the Deep-jawed Lophiodon, from the characteristic proportions of the jaw just cited.

This fossil has been described and figured by Dr. Harlan in Silliman's American Journal of Science, vol. xliii. 1842, pl. 3. fig. 1, under the name of *Sus Americana*, conceiving that from "its general appearance and number of the teeth this fragment bore a close analogy with the same part in the *Sus babirussa*, Buff.," acknowledging, however, that "the Babyroussa" was a much smaller animal. Besides the difference of size, the last molar in the fossil has the anterior transverse ridge proportionally larger and the posterior lobe proportionally smaller than in the Babyroussa, resembling the *Lophiodon* in the points in which it thus differs from the *Sus* cited. The form of the fossil jaw differs at the part supporting the last molar from that in the Babyroussa, where the socket of the last molar overhangs the inner surface of the ramus, whilst in the fossil the inner surface of the ramus beneath the last molar describes a gentle convexity from the tooth to the lower margin of the ramus. The outer part of the ramus of the jaw of the Babyroussa begins to expand below the fourth and fifth molars, counting forwards from the last, to form the socket of the large tusk; but the fossil jaw does not offer the least indication of an enlargement for that purpose, and the fractured anterior end, as displayed in the cast, is very different in shape from the corresponding part of the jaw in the Babyroussa, and shows merely the dental canal and no socket for the tusk which would be here situated in the Babyroussa or Wild Boar.

The nearest approximation which the fossil in question allows to be made to any known existing or extinct animal is to the great tapiroid Pachyderms. Ulterior discoveries, may, indeed, show that the Lophiodont dentition was combined with other characters in the American fossil, necessitating a generic distinction, and it is well to remember that the dentition of the *Macrauchenia* of South America, a three-toed Pachyderm with an astragalus almost identical with that of the *Lophiodon*, and of a size which agrees with the jaw of the fossil *Sus Americana* of Harlan, has yet to be discovered.

The original of the cast here described was brought to light during the excavation of the Brunswick canal, Georgia, North America; it is

completely petrified and impregnated with iron, and was associated with remains of Mastodon, Mammoth and Megatherium.

Presented by Dr. Harlan.

Subgenus *Coryphodon**.

826. The cast of the fragment of the right ramus of the lower jaw of a tapiroid Pachyderm nearly allied to the genus *Lophiodon*, Cuv., with the last molar and part of the penultimate molar *in situ*. These teeth indicate an animal as large as the *Lophiodon Isselanus* (Grand Lophiodon d'Issel), Cuv., and as the *Lophiodon medius*, Cuv.; but the jaw, though less deep than in the *Lophiodon bathygnathus*, is deeper in proportion than in the *Lophiodon Isselanus*, and, *à fortiori*, than in the *Loph. medius*, which is surpassed in this respect by the *Lophiodon Isselanus*. But the more important differences, which determine at least the subgeneric distinction of the extinct Pachyderm indicated by the present fossil, are manifested by the last molar tooth, which is fortunately entire. It has a smaller antero-posterior diameter of the crown in proportion to its transverse diameter, which chiefly depends on the much smaller size of the third or posterior ridge or talon. From the outer extremity of each of the two transverse eminences a ridge is continued obliquely forwards, inwards and downwards: the anterior one extends to the inner and anterior angle of the base of the crown, the posterior terminates at the middle of the interspace between the two ridges. The anterior principal transverse eminence, although it has a trenchant summit, as in the known Lophiodons, yet the edge is more concave, the outer and inner extremities rising each into a conical point. The posterior transverse eminence is much lower than the anterior one and is trituberculate; the trenchant margin, connecting the outer and inner points, does not extend across the crown parallel with the anterior ridge, as in the *Lophiodon*, but forms an angle posteriorly where it develops a third point, which is the highest: from this point the posterior ridge or talon extends downwards and outwards upon the back part of the crown. Thus the crown of the last molar in the present genus has

* κορυφή a point, ὀδὸς a tooth.

the two transverse eminences of a *Lophiodon* so modified, that it supports two pairs of points and one single point, like the last lower molar tooth of the fossil jaw from Lot-et-Garonne, described by Cuvier in the 'Ossements Fossiles,' 1822, tom. iii. p. 404, and like that from the Puy on Velary, described in the posthumous 8vo edition of the same work, vol. v. p. 480, both of which are referred by Cuvier to the genus *Anthracotherium*. The last molar in the present fossil differs, however, from the teeth above cited, in the height of the connecting ridge of the anterior pair of points, and in the development of the fifth or posterior point from the connecting ridge of the posterior pair of points, which ridge is not parallel with the anterior ridge, as in the *Lophiodons*, but is bent backwards, the fifth point forming the angle of the bend. The typical *Anthracotherium*, of which part of the lower jaw, from the lignite beds of *Liguria*, is figured by Cuvier in the 'Ossements Fossiles,' 1822, tom. iii. pl. 80, fig. 2, differs in the deep cleft dividing the anterior pair of tubercles, and in the great development of the bifid posterior or third lobe of the tooth. In the posterior part of the penultimate tooth of the present specimen, it is easy to perceive that the tubercle corresponding with the inner one of the posterior pair in the last molar is obsolete, and represented by a minute eminence near the base of the crown; whilst the tubercle answering to the fifth in the last molar is more elevated, and is nearer the inner side, and the ridge from the outer tubercle terminates there. It is also obvious from the breadth of the fractured part of the anterior fang of the penultimate molar that its antero-posterior diameter must have more nearly equalled that of the last molar than in the true *Lophiodons*. The posterior surface of the anterior ridge of the last molar tooth has been abraded by mastication; and the extent of the fractured jaw behind it proves that there existed no other alveolus posteriorly, but that the perfect tooth *in situ* is the true ultimate molar. The unworn surface of the enamel is minutely but distinctly wrinkled. The characters of the teeth, especially the last molar, of the present fossil indicate that the modifications of the *Lophiodont* dentition, on which the subgenus *Coryphodon* is founded, lead towards the *Anthracotherium*, or at least to those smaller species from Garonne and Velary

which Cuvier refers to that genus. From the closer resemblance which the *Coryphodon cocenus* presents to the true Lophiodons, it more probably belonged to the same family of tapiroid Paehyderms, in which it unquestionably indicates a very distinct and remarkable additional species.

The original of the present cast was dredged up from the bottom of the sea, between St. Osyth and Harwich on the Essex coast, and is now in the collection of John Brown, Esq. of Stanway Green, near Colechester. From the pyritic matter which has been deposited in the pulp-cavity of the penultimate molar there can be little doubt but that the fossil had been imbedded in the Eocene London Clay of the Harwich coast.

Presented by John Brown, Esq., F.G.S.

827. A canine tooth, apparently from the right side, lower jaw, with the summit of the crown broken off accidentally, but showing the effect of the action of the upper canine in an excavated surface at the posterior part of the crown. The general proportions of this tooth, its degree of curvature, and the relative length of the crown and the fang, accord pretty closely with those of the canines of different species of *Lophiodon* figured by Cuvier in the 'Ossemens Fossiles,' 1822, tom. ii. pt. 1. pl. 10. fig. 3 and 12, pl. 9. fig. 11. Like the canine of the *Lophiodon tapiroides* in pl. 9. the growth of the present tooth was completed and the fang terminated by an obtuse solid extremity: but it differs in the fang being less expanded; it is at no part so thick as the base of the enamelled crown: in this respect it resembles more the canine of the *Lophiodon medius*, pl. 10. fig. 12, but the crown of the present tooth is proportionally more expanded at the base. The proportions of the crown more nearly resemble those in the *Lophiodon Isselanus*, pl. 10. fig. 3, but the fang is ventricose in that species, as in the *Lophiodon tapiroides*. Cuvier does not give a figure of the transverse section of the crown of the canine in any of his specimens: that of the present tooth is very characteristic, and resembles the transverse section of the crown of the teeth of the great *Pliosaurus*; the outer surface being flattened, and the rest of the crown so convex as to describe a semicircle: a ridge of enamel along each border of the flattened side separates it from the

convex side of the crown. The flattened surface is gently undulating, convex in the middle and concave at each side near the ridges in the transverse direction: the crown is defended by two layers of enamel: the outer and thicker layer has a minutely wrinkled surface and terminates near the base of the crown by a finely plicated border; extending lower upon the posterior and outer than upon the anterior and inner sides of the crown. The thin and smooth layer of the enamel extends to and defines the base of the crown; the outer layer being coextensive with the inner one only at the two boundary ridges, and the inner layer being extended further upon the tooth at its anterior and inner sides. The length of this tooth must have been three inches when entire; the circumference of the base of the crown is two inches, nine lines. The original was discovered in the London clay, near Camberwell, during the excavations or borings for a well. This tooth, from its obvious relations to the *Lophiodon* and its apparent specific distinction from any in the known species, may probably belong to the same species as that which, from the characters of the preceding specimen, I have named *Coryphodon eocenus*, and which is from the same geological formation, and agrees with it in size and in the wrinkled surface of the enamel.

Presented by Mr. Alport.

Genus *Tapirus*.

828. The plaster-cast of a considerable proportion of the right ramus of the lower jaw of the *Tapirus priscus*, Kaup. The six molar teeth, with the exception of the crown of the third, are preserved *in situ*.

The original, which is in the Grand Ducal Museum at Darmstadt, was discovered in the miocene tertiary beds of sand at Epplesheim, and is described by Dr. Kaup in the 'Ossemens Fossiles du Muséum de Darmstadt,' 4to, 2de Cah., p. 1—3. A more complete specimen is figured in pl. 6. fig. 1. of the same work.

Presented by Dr. Kaup.

Genus *Palæotherium**.

829. A considerable proportion of the right ramus of the lower jaw of the *Palæotherium magnum*, Cuvier, imbedded in a block of gypsum, with the outer surface exposed to view. Four of the molar teeth are present, the first in place is the second in the natural series; the next is the last molar, and has been artificially cemented in its present situation; the two others are in their proper sockets and are the fifth and sixth of the series. The first small molar and the canine are imbedded in one corner of the block; and a portion of another molar is visible anterior to the coronoid process. The crown of each of the molars is defended by a basal ridge: that of the last molar is three-lobed, the rest, with the exception of the first small one, are bilobed. The broad produced and rounded angle of the jaw is well shown in the present specimen, which most resembles the one figured by Cuvier in the 'Ossemens Fossiles,' 1822, tom. iii. pl. 48. fig. 1.

Locality unrecorded, but most probably from Montmartre.

Hunterian.

The following illustrations of the genus *Palæotherium* are plaster-casts of specimens from the gypsum of Montmartre, described and figured by Cuvier in the third volume of the 'Ossemens Fossiles,' 4to edition, 1822.

830. A great proportion of the cranium of the *Palæotherium crassum*, Cuvier. The temporal fossæ which meet above and are separated by a sharp horizontal ridge, occupy one-half of the total length of the skull: the upper surface of the skull anterior to the sagittal ridge is smooth and convex transversely. The occipital crest is square above; as in the Hog, it projects a little further back than the occipital condyles. The nasal bones are prolonged and terminate in a point anteriorly as in the Horse, and are not curtailed and elevated as in the Tapir: their base is very broad where they join the frontal bones. The intermaxillary bones are in advance of the nasals: the notch which divides the nasal from the maxillary bones extends back as far as the fourth molar. The orbit is small and

* παλαιὸν, ancient, θηρίον, beast.

placed low down: it communicates with the temporal fossa, and has its posterior boundary indicated by the post-orbital process above and a process from the malar bone below: the zygomatic arches are so much expanded posteriorly that the breadth of the skull at that part equals nearly half its length. The auditory or tympanic aperture is small and situated as in the Tapir, indicating that the ears were attached low down in the living Palæothere. The incisors are not preserved in the present specimen; but other examples proved them to have been six in number in the upper jaw, three in each intermaxillary bone, as in the Tapir. The canine is slightly curved with a conical crown, trenchant posteriorly; a short diastema divides it from the first molar tooth: the seven teeth of this series, consisting of four premolars and three true molars, are present here; they gradually augment in size as they are situated further back. The first has a simple compressed crown, the rest have a square-shaped crown, with three longitudinal or vertical ridges and two concavities on the outside, and a single furrow on the inside. Cuvier concludes from the structure of this fossil, that, notwithstanding the minor elevation of the cranium and the greater length of the nasal bones, the skull of the Palæotherium bears most resemblance to that of the Tapir.

The original of the present beautiful cast was obtained from the gypsum of Montmartre, and was disencumbered of its stony matrix by the patience and skill of M. Laurillard. Cuvier justly regarded it as the most precious of the fossils from the Paris basin which enrich the Royal Museum. It is described at p. 33, and figured in plates 53 and 54 of the above-cited edition of the 'Ossemens Fossiles.'

Presented by Baron Cuvier.

831. The left ramus, with the symphysis and part of the right ramus, of the lower jaw of the same individual *Palæotherium crassum* as the foregoing cranium. Both canines and the entire series of molars of the left side are present in this specimen: the crown of the first molar is simple and trenchant: the enamel is disposed on the grinding surface of the five following teeth in two crescents, one before the other, with their convexity turned outwards, and which by trituration become double crescentic

ridges of enamel ; the seventh molar has three lobes and crescents upon the crown.

The original of this specimen is figured in plate 53 of the edition of the 'Ossemens Fossiles' above cited.

Presented by Baron Cuvier.

832. The left radius of the *Palæotherium crassum*, Cuv. The head of the bone corresponds nearly with that of the Tapir, but is narrower from before backwards ; and the salient angle of its posterior margin, by which it interlocks with the ulna, is less acute and less prominent. The body of the bone is more slender than in the American Tapir ; the configuration of the distal end is nearly the same as in the Tapir, but the intertendinal prominences and ridges are less developed.

Presented by Baron Cuvier.

833. The radius and bones of the right fore-foot of the *Palæotherium crassum*, Cuvier.

Presented by the Professors-Administrators of the Museum of Natural History of Paris.

The following casts are of the bones of the left fore-foot of the same individual Palæothere.

834. The astragalus of the *Palæotherium crassum* : it presents a deep trochlear surface for the tibia ; a large rhomboidal articulation anteriorly for the os naviculare, which is continuous with a narrow facet externally for the cuboid bone, as in the Rhinoceros and Tapir : the cuboidean facet in the Horse is much narrower, that in the Hog and Ruminants is much broader. There are two distinct articulations for the calcaneum besides the one continued from the scaphoidal surface : the outer and posterior articulation is concave and deeper than in the Tapir ; the inner and anterior one is narrower and more convex than in the Tapir.

Presented by Baron Cuvier.

834¹. The astragalus of the American Tapir.

Purchased.

835. The left calcaneum of the *Palæotherium crassum*. It presents two distinct surfaces for the astragalus, besides a small portion continued from the

facet for the cuboid bone. The posterior articular surface is continued a little way upon the upper part of the bone. The internal one is more oblong than in the Tapir, but, in almost every other respect, this bone closely resembles the astragalus of the Tapir, whilst it differs in a marked degree from that of other existing Pachyderms.

Presented by Baron Cuvier.



835¹. The left calcaneum of the American Tapir. *Purchased.*

836. The left os scaphoides of the *Palæotherium crassum*.

Presented by Baron Cuvier.

836¹. The left os scaphoides of the American Tapir. *Purchased.*

837. The left os cuboides of the *Palæotherium crassum*. It has a single anterior articular surface for the metatarsal of the toe corresponding to the fourth in the pentadactyle foot: the fifth toe, like the first or innermost, is wanting in the Palæotherium. *Presented by Baron Cuvier.*

837¹. The left os cuboides of the American Tapir. *Purchased.*

838. The external cuneiform bone of the *Palæotherium crassum*: this bone supports, as usual, the middle metatarsal.

Presented by Baron Cuvier.

838¹. The external cuneiform bone of the American Tapir. *Purchased.*

839. The middle cuneiform bone of the *Palæotherium crassum*: this bone supports the innermost, which corresponds with the second metatarsal bone in the pentadactyle foot. *Presented by Baron Cuvier.*

839¹. The middle cuneiform bone of the American Tapir. *Purchased.*

840. The internal cuneiform bone of the *Palæotherium crassum*: this is small but elongated, supports no metatarsal bone, but is the sole representative of the hallux or innermost toe. *Presented by Baron Cuvier.*

841. The three metatarsal bones of the *Palæotherium crassum*: *m* 2. the inner, *m* 3. the middle, and *m* 4. the outer bone. *Presented by Baron Cuvier.*

- 841¹. The three metatarsals of the American Tapir, similarly numbered according to the toes to which they are analogous in the pentadactyle foot. *Purchased.*
842. The three phalanges of the inner toe of the *Palæotherium crassum*, corresponding to the second in the pentadactyle foot. The last or ungual phalanx is broader, flatter and more rugged than in the Tapir. *Presented by Baron Cuvier.*
- 842¹. The three phalanges of the American Tapir. *Purchased.*
843. The three phalanges of the middle toe of the *Palæotherium crassum*. *Presented by Baron Cuvier.*
- 843¹. The corresponding phalanges of the American Tapir. *Purchased.*
844. The three phalanges of the outer toe of the *Palæotherium crassum*. *Presented by Baron Cuvier.*
- 844¹. The corresponding phalanges of the American Tapir. *Purchased.*
845. The astragalus of the *Palæotherium magnum*: it closely resembles, save in size, that of the *Palæotherium crassum*. *Presented by Baron Cuvier.*
846. The calcaneum of the *Palæotherium magnum*. *Presented by Baron Cuvier.*

Genus *Rhinoceros*.

847. A cast of the cranium of the *Rhinoceros tichorhinus*, Cuv. The original was discovered in the drift formation in Siberia, and is figured in Cuvier's 'Ossemens Fossiles,' ed. 1822, pl. 12. The skull of the extinct two-horned tichorhine *Rhinoceros* surpasses in length not only absolutely but proportionally to its breadth, that of any known existing species; the nasal bones are more especially produced, and the rugous surface for the anterior horn which they support is an oblong ellipse, traversed by a median longitudinal ridge, whilst in the African two-horned *Rhinoceros*

it is a semicircle, and is impressed by a median longitudinal furrow: the posterior rugous disc is also elongated, and is confluent with the anterior one in the present example, indicating that the horns were very large and more compressed than in the existing species. The occipital surface inclines backwards and the ridge overhangs the condyles. The intermaxillary bones are longer than in the existing species; but the most important anatomical character of the present extinct *Rhinoceros* is the extension of the bony septum of the nose to the anterior extremity of the nasal bones, which, instead of standing out freely, bend down, and become confluent with the vomer and the intermaxillary bones. The specific name *tichorhinus* has reference to this peculiarity, which adds so much solidity and strength to the support of the anterior horn.

Presented by Dr. Buckland.

848. A cast of the right horizontal ramus of the lower jaw of the *Rhinoceros leptorhinus*, Cuv., with the two posterior molar teeth, much abraded by mastication *in situ*, and the sockets of the five anterior molars. These extend to the anterior extremity of the fragment, the outer contour of which inclines inwards so as to clearly indicate its close proximity to the anterior end of the symphysis: the posterior margin of this conjunction is opposite the interspace between the second and third molar. The evidence of the shortness of the symphysis and the forward position of the anterior molars concur in proving the present fossil to belong to the extinct *Rhinoceros*, "à narines non cloisonnées," or the *Rhin. leptorhinus* of Cuvier, which appears to be the most common species in the newer tertiary deposits of Italy.

The original of the present cast was discovered in the till or freshwater deposits at Walton in Essex.

Presented by John Brown, Esq., F.G.S.

849. A fragment of the right ramus of the jaw of the *Rhinoceros leptorhinus*, Cuv., with the three posterior or true molars *in situ*: they are much less worn than in the preceding specimen, and well exhibit the characteristic double oblique crescents of enamel upon the grinding surface.

The original was discovered in the till at Walton in Essex.

Presented by John Brown, Esq., F.G.S.

850. A cast of the symphysis and part of the left ramus of the same lower jaw of the leptorhine Rhinoceros. This fragment demonstrates the shortness of the symphysis characteristic of the species, by which it approximates the two-horned Rhinoceros of the Cape, and differs from the tichorhine Rhinoceros of Siberia. The fourth molar tooth is entire and *in situ*.
Presented by John Brown, Esq., F.G.S.

851. A cast of the symphysis of the lower jaw of a younger specimen of *Rhinoceros leptorhinus*, including three of the anterior molars of the left side.
From the freshwater deposits at Clacton in Essex.
Presented by John Brown, Esq., F.G.S.

852. A cast of a fragment of the left superior maxillary bone of the *Rhinoceros leptorhinus*, including the penultimate molar tooth.
From the freshwater deposits at Clacton in Essex.
Presented by John Brown, Esq., F.G.S.

853. A fossil fragment of an upper jaw with a molar tooth of probably the same species of Rhinoceros, from the same stratum and locality. The teeth in both specimens closely correspond with those of the existing one-horned Rhinoceros of India.
Presented by the Rev. E. Everest, M.A.

854. A fossil fragment of the left ramus of the lower jaw of a Rhinoceros, with portions of two molar teeth.
From the tertiary formations of the Sub-Himalayan district, India.
Presented by the Rev. E. Everest, M.A.

855. The crown of the fourth molar, right side, upper jaw, of the *Rhinoceros tichorhinus*: the summits of the enamelled ridges of the crown had just begun to be abraded.
From the cave at Kent's Hole, Torquay, Devon.
Presented by Gerard Smith, Esq.

856. The crown of the antepenultimate or fifth molar, right side, upper jaw, of the *Rhinoceros tichorhinus*, which had not cut the gum or been provided with fangs.
From Kent's Hole, Torquay. *Presented by Gerard Smith, Esq.*

857. The fifth molar, left side, upper jaw, of the *Rhinoceros tichorhinus*, with the crown moderately worn.

From Kent's Hole, Torquay. *Presented by Gerard Smith, Esq.*

858. The fifth molar, right side, upper jaw, of the *Rhinoceros tichorhinus*.

From the drift, five miles west of Worcester.

Presented by Sir Everard Home, Bart., F.R.S.

859. The penultimate or sixth molar, right side, upper jaw, of the *Rhinoceros tichorhinus*: the crown of the tooth had but recently come into use at the period when the animal perished.

From the drift, five miles west of Worcester.

Presented by Sir Everard Home, Bart., F.R.S.

860. The crown of the fifth molar, right side, upper jaw, of the *Rhinoceros tichorhinus*.

From the drift of Gloucestershire. *Presented by Mr. Fisher.*

861. The sixth molar, right side, upper jaw, of the same *Rhinoceros*: being posterior to the preceding, the crown is less worn.

From the drift of Gloucestershire. *Presented by Mr. Fisher.*

862. The penultimate or sixth molar, right side, upper jaw, of the *Rhinoceros tichorhinus*.

From the unstratified drift of Brunn, near Engersdorf, in Lower Austria.

Hunterian.

862¹. The corresponding molar of a recent *Rhinoceros*.

Hunterian.

863. A fragment of an upper molar of a *Rhinoceros*.

Locality unrecorded. *Hunterian.*

864. The crown of the third deciduous molar, left side, lower jaw, with fragments of a large molar, of the *Rhinoceros leptorhinus*?

From the unstratified drift of Zessa, near Schlachen, Bohemia.

Hunterian.

865. The penultimate or sixth molar, right side, lower jaw, of the *Rhinoceros tichorhinus*.

From the cave at Kirkdale, Yorkshire.

Presented by John Gibson, Esq., F.G.S.

866. The penultimate molar, right side, lower jaw, of the *Rhinoceros tichorhinus*.
From the cave at Kent's Hole, Torquay.

Presented by Gerard Smith, Esq.

867. The penultimate molar, right side, lower jaw, of the *Rhinoceros tichorhinus*.
Locality unrecorded. *Hunterian.*

868. A cast of the proximal end of the right humerus of the *Rhinoceros Schleiermacheri*, Kaup.

The original is described in the 'Ossemens Fossiles du Muséum de Darmstadt,' 3^{me} Cah., p. 42, and an entire humerus of the same species is figured in tab. xiii. fig. 4.

From the miocene tertiary formation at Epplesheim.

Presented by Sir Philip de M. Grey Egerton, Bart., M.P.

869. Part of the head of the left humerus of a Rhinoceros: it is almost completely petrified.

From Lissa, near Lackenwerth, in Bohemia.

Hunterian.

870. The distal half of the left humerus of the *Rhinoceros tichorhinus*: a great part of the articular condyles has been broken off, and apparently gnawed.
From the Hyæna Cave at Kirkdale.

Presented by John Gibson, Esq., F.G.S.

871. Part of the shaft and distal end of the left humerus of the *Rhinoceros tichorhinus*; from which a great part of the articular condyles has been similarly fractured and gnawed away.

From the Hyæna Cave at Kirkdale.

Presented by John Gibson, Esq., F.G.S.

872. A fragment of the proximal extremity, with part of the articular surface, of the left ulna of the *Rhinoceros tichorhinus*.

From Kent's Hole, Torquay.

Presented by Gerard Smith, Esq.

873. A gnawed fragment of the radius of apparently the same Rhinoceros; from which all the cancellous structure has been removed; its condition being very like that of a marrow-bone which has been sucked dry by a bear.

From the cave of Kent's Hole, Torquay.

Presented by Gerard Smith, Esq.

874. A gnawed fragment of the femur of a *Rhinoceros*.

From the cave of Kent's Hole, Torquay.

Presented by Gerard Smith, Esq.

875. A fragment of a long bone of a *Rhinoceros* ; showing the marks of having been gnawed.

From the cave of Kent's Hole, Torquay.

Presented by Gerard Smith, Esq.

876. The distal extremity of the left os femoris of the *Rhinoceros tichorhinus*.

From the drift in the neighbourhood of Moscow.

Purchased.

The following specimens of fossil remains of the *Rhinoceros* constituted part of the skeleton of one individual, which was discovered by the donor, Joseph Whidbey, Esq., Civil Engineer, in a cavernous fissure of the limestone quarries at Oreston, near Plymouth.

877. The crown of the right antepenultimate molar of the upper jaw of a *Rhinoceros* (*Rhinoceros tichorhinus*, Cuv.).

878. The crown of the left antepenultimate molar of the upper jaw of the same *Rhinoceros*. One side is broken away, displaying the thickness of the enamel and the coronal cement.

879. A considerable portion of the second molar of the left side of the upper jaw of the same *Rhinoceros*.

880. The crown of the penultimate molar of the right side of the lower jaw of the same *Rhinoceros*.

881. The crown of the third molar of the left side of the lower jaw of the same *Rhinoceros*.

882. Half of the crown and one of the fangs of an anterior molar of the left side of the lower jaw of the same *Rhinoceros*.

883. The upper and posterior part of the neural arch of the atlas, showing the two posterior articular processes and the perforation for the nerves, of the same *Rhinoceros*.

884. A portion of the fifth dorsal vertebra, including the articular surfaces for the head and tubercle of the rib on the left side, and showing the rough surface on the anterior and posterior sides of the body, from which the articular epiphyses have been detached, of the same Rhinoceros.
885. The body of a dorsal vertebra of the same Rhinoceros, showing the terminal rough surfaces, with the detached articular epiphyses, and part of the articular surface for the head of the left rib.
886. The body of a dorsal vertebra of the same Rhinoceros.
887. The body of a dorsal vertebra of the same Rhinoceros.
888. The body of an anterior caudal vertebra of the same Rhinoceros.
889. A body and part of the neural arch of a middle caudal vertebra of the same Rhinoceros : the detachment of the articular epiphysial extremities of all these vertebræ correspond with the condition of the teeth, and prove the immaturity of the individual to which they belonged.
890. A small fragment of one of the anterior ribs of the same Rhinoceros.
891. A small fragment of one of the anterior ribs of the same Rhinoceros.
892. A fragment of one of the middle ribs of the same Rhinoceros.
893. A fragment of one of the posterior ribs of the same Rhinoceros.
894. The symphysial extremity of the right os pubis of the same Rhinoceros.
895. Another fragment of the same os pubis.
896. The glenoid cavity of the right scapula of the same Rhinoceros.
897. The coracoid process and part of the glenoid cavity of the left scapula of the same Rhinoceros.
898. The proximal extremity, with the head of the left humerus, of the same Rhinoceros : the epiphysis supporting the articular surface has been detached, illustrating the same immature condition of the skeleton as the associated vertebræ : the fractured surface shows the extremely delicate cancellous structure of the bone in the Rhinoceros.

899. The distal extremity of the left humerus of the same Rhinoceros : the epiphysis is here ankylosed to the shaft of the bone.
900. The olecranon and part of the great sigmoid cavity of the right ulna of the same Rhinoceros : the epiphysis of the olecranon has been detached.
901. The distal epiphysis, with the articular extremity of the right ulna, of the same Rhinoceros.
902. The proximal half of the left radius : the proximal epiphysis is here ankylosed to the shaft.
903. The distal half, wanting the epiphysis, of the right radius of the same Rhinoceros.
904. The right os unciforme, with the unciform process broken off, of the same Rhinoceros.
905. The middle metacarpal bone of the right fore-foot of the same Rhinoceros : both epiphyses are ankylosed to the shaft, which is one-fourth longer in proportion to its breadth, than in the *Rhinoceros indicus*.
906. The distal end of the right inner metatarsal bone of the same Rhinoceros.
907. The fractured distal end of the right middle metatarsal of the same Rhinoceros.
908. The proximal phalanx of the middle toe of the right fore-foot of the same Rhinoceros.
909. The proximal part of the right femur, with the head and great trochanter in the state of detached epiphyses ; the depression for the ligamentum teres is shallower than in the femur of a young *Rhinoceros indicus*, in a corresponding state.
910. A portion of the distal epiphysis of the right femur, including the external condyle, of the same Rhinoceros.
911. A portion of the distal epiphysis, including the rotular surface of the left os femoris of the same Rhinoceros.

- 912. A portion of the distal epiphysis, including the external condyle of the left femur, of the same *Rhinoceros*.
- 913. A portion of the distal epiphysis, including the internal condyle of the left femur, of the same *Rhinoceros*.
- 914. The left patella of the same *Rhinoceros*.
- 915. A fragment of the proximal extremity of the left tibia of the same *Rhinoceros*.
- 916. Part of the head of the right humerus of the *Rhinoceros tichorhinus*: it has belonged to an older individual than the foregoing specimens, the proximal epiphysis being ankylosed.

From one of the Oreston limestone caverns.

Presented by Joseph Whidbey, Esq.

- 917. Portions of the argillaceous sand which filled the cavern in which the foregoing fossils were discovered.

Presented by Joseph Whidbey, Esq.

Mr. Whidbey describes the cavern containing the foregoing fossils as a kind of fissure in the solid limestone rock; measuring fifteen feet wide, forty-five feet long, taking the direction into the cliff, and twelve feet deep.

This cavern was filled with solid clay or clayey sand, in which the bones were imbedded; they were situated about three feet above the bottom of the cavern.

When Mr. Whidbey began to work this quarry the rock was seventy-four feet perpendicular above high-water; the bones were found seventy feet below the surface of the rock, and about four feet above high-water mark. He quarried sixty feet horizontally into the cliff before he came to the cavern.

Before Mr. Whidbey began to quarry here, one hundred feet had been quarried into the cliff, so that one hundred and sixty feet was the distance between the cavern and the original edge of the cliff; in all other directions the quarries consist of compact limestone to a great extent.

The workmen came to this cavern by blasting through the solid rock, and at the depth in the rock at which it was met with, the surrounding limestone was everywhere equally strong, and required the same labour to quarry it: Mr. Whidbey at that time saw no indication of the cavern having had any external communication through the rock in which it was inclosed. See Philosophical Transactions for 1817, 1821 and 1823. Dr. Buckland's opinion of the mode in which the mammalian bones were introduced into the Oreston caverns is cited at p. 19, in connection with the remains of the Wolf, and more especially the specimen No. 92, and to this opinion Mr. Whidbey subsequently saw reason to assent.

918. A cast of the crown of the third premolar, left side, upper jaw, of a young *Rhinoceros tichorhinus*.

The fangs had not begun to be formed when the animal perished.

From the bone-cave at Kühloch.

Presented by the Earl of Enniskillen, D.C.L.

Genus *Acerotherium*.

919. The second premolar tooth of the right side, lower jaw, of the extinct Hornless Rhinoceros (*Acerotherium incisivum*, Kaup, *Rhinoceros incisivus*, Cuvier).

From the miocene tertiary deposits at Epplesheim.

Presented by Dr. Kaup.

920. The fourth premolar, right side, upper jaw, of the *Acerotherium incisivum*.

From the miocene tertiary deposits at Epplesheim.

Presented by Dr. Kaup.

921. The antepenultimate molar, right side, lower jaw, of the *Acerotherium incisivum*.

From the miocene tertiary deposits at Epplesheim.

Presented by Dr. Kaup.

922. Fragments of a molar tooth of the *Acerotherium incisivum*, Kaup.

Presented by Dr. Kaup.

Genus *Elasmotherium**.

923. A cast of the left ramus of the lower jaw, including the symphysis, of the *Elasmotherium Fischeri*, Cuvier. The entire length of the jaw is twenty-six inches, the molar series is ten inches and a half in extent and terminates at the middle of the jaw. The condyle is transverse, but the articular surface is of comparatively small size; there appears to be a second articular surface at the back part of the inner angle of the condyle; a thick, depressed, and nearly transverse process has been broken away from the back of the condyle. The inner extremity of the process forms a protuberance below the inner facet of the condyle. The angle of the jaw is rounded off and forms, with the thick convex inferior border of the horizontal ramus, a continuous curve, like that of the lower jaw in the Elephant, which it likewise resembles in its short and shallow edentulous symphysis; but it differs from the Elephant in the extension of a coarse rugged ridge along both the outer and the inner margins of the base of the ascending ramus, the outer ridge ending abruptly on a line with the termination of the molar series.

The *Elasmotherium* resembles the Rhinoceros in the structure of the condyle, especially in the division of the articular surface into an outer convex horizontal facet and an inner posterior vertical and slightly concave surface; the correspondence is further manifested in the tubercle below this surface and in the obtuse ridge running along the back of the condyle which is indicated by the fractured surface.

The *Elasmotherium* differs from the Rhinoceros in having the angle of the jaw less produced; and the dental canal commences nine inches in advance of the condyle. The molar teeth of the *Elasmotherium* are five in number in each ramus of the jaw, the anterior one being very small; the penultimate one the largest, measuring three inches in the antero-posterior diameter, and two inches in the transverse diameter of the crown. The enamel is remarkable for its beautiful undu-

* Ἐλασμα a plate, θηρίον beast: in allusion to the plicated plates of enamel in the substance of the molar teeth.

lating folds ; but its general disposition most resembles that in the inferior molars of the Rhinoceros. The teeth of the *Elasmotherium* differ from those of the Rhinoceros, and resemble those of the Horse in the great depth to which they are implanted in the jaw, before being divided into roots : the socket of the penultimate grinder extends, in fact, to the lower margin of the jaw without any indication of partitions for the lodgement of fangs : there is no trace of incisive teeth in the portion of symphysis which is preserved, and which extends a little more than three inches in advance of the first small molar.

The original of this specimen is preserved in the Museum of Moscow, and is unique ; it was discovered in the frozen drift or diluvium of Siberia.

Presented by R. I. Murchison, Esq., P.G.S.

Genus *Macrauchenia* *.

924. The third or fourth cervical vertebra of the *Macrauchenia patachonica*, Owen. The anterior articular end of the body has been broken off, and the anterior orifices of the canals for the vertebral artery may be seen close to the inner surface of the neural arch, on the fractured end of the vertebra.

From the tertiary deposits of Port St. Julian, Patagonia.

Presented by Charles Darwin, Esq., F.R.S.

925. The fourth or fifth cervical vertebra of the *Macrauchenia patachonica*; wanting the posterior articular processes : both the entry and the outlet of the characteristic intra-spinal canal for the vertebral artery may be observed on the inside of the neural arch, in the angle between it and the body of the vertebra on the right side.

From the tertiary deposits of Port St. Julian, Patagonia.

Presented by Charles Darwin, Esq., F.R.S.

925'. The fourth cervical vertebra of a Llama (*Auchenia Glama*); to show its correspondence in general form and structure with the cervical vertebra of the *Macrauchenia*, and especially in the position of the canals for the vertebral arteries, which canals perforate the neural arch and

* μακρὸς long, ἀνχῆν neck.

open into the canal for the spinal chord; this structure is peculiar to the Camel tribe amongst existing Mammalia.

Presented by Professor Owen, F.R.S.

925². The third cervical vertebra of a Llama vertically and longitudinally bisected, to show more closely the position and extent of the canals for the vertebral arteries.

Presented by Professor Owen, F.R.S.

Both of the cervical vertebræ of the *Macrauchenia* are of the same size; each measures seven inches and a half in extreme length, three inches and a half in breadth, and four inches in depth.

In the Giraffe and the Camel-tribe the spinous processes are thin laminae of considerable extent in the axis of the vertebra, but rising to a very short distance above the level of the vertebral arch: the spinous processes have the same form in the corresponding vertebræ of the *Macrauchenia*, but present a still greater longitudinal extent: they commence at the interspace of the anterior oblique processes and extend to opposite the base of the posterior oblique processes; the upper margin describing a gentle curve. The transverse processes also present the form of slightly produced, but longitudinally extended, laminae: their disposition is essentially the same as in the *Camelidae*, but more nearly corresponds with the modifications presented by the *Auchenia*, or South American species. The inferior transverse processes—the only ones that are developed in fishes, but which are present in the cervical vertebræ in Mammals—are continued in the *Macrauchenia*, from the sides of the under surface of the anterior part of the body of the vertebra; their extremities being broken off, it cannot be determined from the present specimens how far they extended from the body of the vertebræ, but they gradually subside as they pass backwards: the superior transverse processes are continued outwards from the sides of the posterior part of the body of the vertebræ, and gradually subside as they advance along three-fourths of the body of the vertebra: they are not continued into the anterior and inferior transverse processes, as in the Llama and Vicugna, but are separated therefrom by a narrow and shallow groove. The articular or oblique processes closely resemble those of the Llama in form and in the

direction of the articular surfaces : those of the anterior processes looking inwards and a little upwards ; those of the posterior outwards and a little downwards.

In the *Macrauchenia* a small longitudinal process is given off immediately below the base of the anterior oblique process ; this structure is not observable in any of the cervical vertebræ of the Giraffe or Camel tribe. In the form of the articulating surfaces of the bodies of the vertebræ the *Macrauchenia* deviates from the Giraffe and Camel but resembles the Llama and Vicugna. In the Giraffe and Camel the anterior articulating surface is convex and almost hemispheric. The posterior surface is proportionally concave, so that the cervical vertebræ are articulated by ball and socket joints ; yet not as in most reptiles with intervening synovial cavities, but by the concentric ligamentous intervertebral substance characteristic of the mammiferous class. In the Llama and Vicugna the degree of convexity and concavity in the articular surface of the bodies of the cervical vertebræ is much less than in the Camels ; and consequently they carry their necks straighter and more erect. In the *Macrauchenia* the anterior articulating surface presents a still slighter convexity than in the Llama, and the posterior surface presents a correspondingly shallower concavity. The form of the extremities of the body of the vertebræ, especially of the posterior, is subhexagonal, the breadth being to the depth as eight to five.

The sides and under part of the vertebræ are slightly concave ; on the inferior surface there are two ridges continued forwards from the posterior margin of the vertebra, each situated about an inch distant from the middle line ; they converge as they pass forwards and are gradually lost in the level of the vertebra ; their greatest elevation does not exceed half an inch. In the *Auchenia* there is a longitudinal protuberance in the mesial line, instead of the two ridges. The two long cervical vertebræ of the *Macrauchenia* are also characterised by the maintenance of an almost uniform diameter of the body, both in its vertical and transverse extent : the cervical vertebræ of the Vicugna come nearest to them in this respect : those of the Camel deviate further in the large excavation at the under part of the body.

The long vertebral or spinal canal is slightly expanded in the present fossils at the two extremities; this expansion, which is generally in the ratio of the extent of motion of the vertebræ on each other, is more marked in the Camel, where the form and mode of articulation of the bodies of the vertebræ are designed to admit of a free and extensive inflection of the cervical vertebræ; such as is exemplified in the sigmoid flexure of the neck in the living animal. In the *Auchenia*, on the contrary, the neck is less gracefully carried erect and in an almost straight line, and the form of the vertebræ and the nature of their joints correspond to this condition. From the length of the bodies of the cervical vertebræ of the *Macrauchenia*, and the almost flattened form of their anterior and posterior articular surfaces, it may be inferred that the long neck of this singular extinct quadruped was carried in the same stiff and upright position as in the Llama and Vicugna.

The following individual differences are observable in the two cervical vertebræ of the *Macrauchenia*:—in the posterior one, No. 925, the superior arch is wider and with thicker parietes, the body is more concave below, and the inferior transverse processes have a more lengthened origin.

926. The fractured body of the first lumbar vertebra of the *Macrauchenia patachonica*: the floor of the spinal canal is traversed by a strong median longitudinal eminence.

From the tertiary deposits of Port St. Julian, Patagonia.

Presented by Charles Darwin, Esq., F.R.S.

927. A fractured body of the second lumbar vertebra of the *Macrauchenia patachonica*: the longitudinal eminence on the floor of the spinal canal is less developed in this specimen.

From the tertiary deposits of Port St. Julian, Patagonia.

Presented by Charles Darwin, Esq., F.R.S.

928. A fractured body of the third lumbar vertebra of the *Macrauchenia patachonica*; it is much compressed and reduced to a ridge along the middle of its under surface.

From the tertiary deposits of Port St. Julian, Patagonia.

Presented by Charles Darwin, Esq., F.R.S.

929. A fractured fourth lumbar vertebra of the *Macrauchenia patachonica* : an abnormal growth of bone from its posterior margin, tending to produce ankylosis with the adjoining vertebræ, indicates the animal to have been aged.

From the tertiary deposits of Port St. Julian, Patagonia.

Presented by Charles Darwin, Esq., F.R.S.

930. A fractured fifth lumbar vertebra of the *Macrauchenia patachonica* : the transverse diameter of the spinal canal at its anterior outlet is one inch seven lines ; the vertical diameter being one inch three lines : the median ridge and lateral depressions still characterize the floor of the canal.

From the tertiary deposits of Port St. Julian, Patagonia.

Presented by Charles Darwin, Esq., F.R.S.

931. A fractured sixth lumbar vertebra of the *Macrauchenia patachonica*.

From the tertiary deposits of Port St. Julian, Patagonia.

Presented by Charles Darwin, Esq., F.R.S.

932. Fragments of the neural arches of some of the preceding lumbar vertebræ.

933. The anterior articular or oblique processes of some of the preceding lumbar vertebræ.

934. Three fragments including the body and portions of the two transverse processes of the last or seventh lumbar vertebra of the *Macrauchenia patachonica* ; the posterior surface of each transverse process is characterised by a large and deep transversely oval articular surface, exceeding in size the intermediate articular process in the body of the vertebra ; this three-fold articulation of the true with the false vertebræ, does not exist in the species of the Camel tribe, but is peculiar among existing Mammalia to the Horse, Hippopotamus, Tapir and Rhinoceros.

The articulations of the body and transverse processes of the last lumbar vertebra of the *Macrauchenia* differ, however, from the corresponding articular surfaces of the Horse, inasmuch as the middle surface is convex, while the two lateral ones are concave, and these are moreover relatively larger than in the Horse or Hippopotamus ; by this structure the trunk

was more firmly locked to that segment of the vertebral column which receives and transmits to the rest of the body the motive impetus given by the hinder extremities, which are in all quadrupeds the chief powers in progression on dry land; while at the same time the shock must have been diminished by the great extent of interposed elastic cartilages; and a certain yielding or sliding motion would be allowed between the lumbar vertebræ and sacrum.

From the tertiary deposits of Port St. Julian, Patagonia.

Presented by Charles Darwin, Esq., F.R.S.

935. Fragments of the pelvis including the two convex articular surfaces on the transverse processes of the anterior sacral vertebra, adapted to the concavities on those of the posterior lumbar vertebra; and a small portion of the acetabulum.

From the tertiary deposits of Port St. Julian, Patagonia.

Presented by Charles Darwin, Esq., F.R.S.

936. Fragments of the left scapula of the *Macrauchenia patachonica*.

From the tertiary deposits of Port St. Julian, Patagonia.

Presented by Charles Darwin, Esq., F.R.S.

The acromion commences about half an inch behind the glenoid cavity, and rises at once to the height of three inches above the plane of the scapula, in which structure we may trace the same tendency to the Ruminant type as is manifested in the scapula of the Hippopotamus and Anoplotherium; for in most other Pachyderms the spine increases gradually in height from both its extremities to the middle part. The anterior margin of the spine beneath the short acromion is perforated by an elliptical fissure measuring ten lines by three lines. The extent of the spine which is preserved measures eight inches and a half: it is a thin and nearly straight plate of bone, expanding into a thick and rugged upper margin, which slightly overarches the inferior fossa.

In its general form and proportions the spine of the scapula in the *Macrauchenia* presents the nearest resemblance to that of the Hippopotamus; but its origin is closer to the articular surface of the scapula than in this or any other Pachydermal or Ruminant animal.

937. The proximal extremities of the anchylosed radius and ulna of the *Macrauchenia patachonica*.

From the tertiary deposits of Port St. Julian, Patagonia.

Presented by Charles Darwin, Esq., F.R.S.

The portion of the antibrachium of the *Macrauchenia* which is preserved, presents a condition of the radius and ulna intermediate to those which respectively characterise the same bones in the Pachyderms and Camels. In the former the radius and ulna are separated bones, united in the prone position by ligament, but so closely and firmly that the movement of supination cannot be performed: in the ordinary Ruminants they are partially joined by bony confluence, which rarely extends to the proximal extremities: in the Camel and Llama the anchylosis of the radius and ulna is so complete that no trace of their original separation can be perceived, and the olecranon appears but as a mere process of the radius.

In the *Macrauchenia* the anchylosis of the radius and ulna is also complete, but the boundary line of the two originally distinct bones is very manifest, and the proportion which each contributes to the great articulating surface for the distal end of the humerus is readily distinguishable. About a sixth part of this surface is due to the head of the radius, which enters into the composition of the anterior and outer part of the articulation, and its extent is defined by a depressed line, describing a pretty regular curve, with the concavity directed forwards and a little outwards.

The following bones belong to the same right fore-foot; they were discovered in the tertiary deposits of Port St. Julian, Patagonia, and

Presented by Charles Darwin, Esq., F.R.S.

938. The inner metacarpal bone, corresponding to the second in pentadactyle quadrupeds, of the *Macrauchenia patachonica*.
939. The middle metacarpal bone of the *Macrauchenia patachonica*.
940. The outer metacarpal bone, corresponding to the fourth in pentadactyle quadrupeds, of the *Macrauchenia patachonica*.
941. The proximal phalanx of the inner toe of the *Macrauchenia patachonica*.

942. The middle phalanx of the same toe.
943. The distal or ungual phalanx of the same toe.
944. The proximal phalanx of the middle toe of the *Macrauchenia patachonica*.
945. The proximal phalanx of the outer toe of the *Macrauchenia patachonica*.
946. The middle phalanx of the same toe.

The instructive portion of the right fore-foot to which the last-described bones belong, presents the most important difference between the extinct *Macrauchenia* and the Ruminantia, to which it is allied in the peculiar structure of the cervical vertebræ, and shows its essential affinities to be to the tridactyle Pachyderms, as the Tapir, the Rhinoceros, and more particularly to the extinct tapiroid Pachyderms of the Eocene tertiary formations of Europe, called *Lophiodon* and *Palæotherium*. These bones demonstrate that the *Macrauchenia* had three toes on the fore-foot and not more; and that the fully developed metacarpal bones are distinct, and correspond in number with the toes, and are not ankylosed into a single cannon-bone as in the Ruminants. The distal articulating facet of each of the metacarpal bones extends so far upon both the anterior and posterior surfaces as to describe more than a semi-circle; in the two lateral metacarpals it is traversed throughout by a longitudinal convex ridge dividing it into two equal lateral parts; the ridge is most produced on the posterior half of the joint; in the middle metacarpal this ridge subsides before it reaches the anterior part of the articular surface.

The structure of the above-described joint proves that the motion of the toe upon the metacarpus was much freer and more extensive than in the Rhinoceros, which is the only existing ungulate mammal which presents the tridactyle structure in the fore-foot. In this species the metacarpo-phalangeal articulations exhibit only a slight trace of the longitudinal ridge and grooves which are confined to the posterior part of the joint; these are more developed in the Camelidæ; but the Hog and Horse in this respect approach nearer to the *Macrauchenia*, though the

structure of the metacarpo-phalangeal joints in the Hog falls far short of the compactness and strength, combined with freedom of flexion and extension, which distinguish those of the *Macrauchenia*: the *Palæotherium medium*, Cuv., most resembles the *Macrauchenia* in the structure of the trochlear metacarpo-phalangeal joints; but both in this species and the *Palæotherium crassum*, the articular surface at the distal end of the metacarpal bone is relatively narrower than in the *Macrauchenia*: moreover, all the species of the extinct Palæothere differ from the *Macrauchenia* in the greater size and strength of the middle as compared with the lateral metacarpal bones. The last phalanx does not resemble the neatly defined ungulate phalanges of the Ruminantia and Solipeda, but has the irregular form characteristic of those of the *Pachyderma*; it is wedge-shaped, broader than it is long, with a rugged surface, except where it plays upon the distal end of the second phalanx, where it is slightly concave in one direction and convex in the other. A portion of this phalanx extends backwards behind the articular surface as in the corresponding bone of the Palæothere and *Rhinoceros*.

947. The right femur of the *Macrauchenia patachonica*.

From the tertiary deposits of Port St. Julian, Patagonia.

Presented by Charles Darwin, Esq., F.R.S.

This fine bone is full two feet in length, and consequently longer than the femur of any known Camel or *Rhinoceros*; as compared with its transverse diameter it is much longer than the femur of the latter animal: in the proportion of its breadth to its length and the expansion of its extremities as compared with the diameter of the shaft, it more resembles that of the Camel. The femur of the Giraffe differs from that of the *Macrauchenia* in the excessive expansion of its distal extremity. But the most striking evidence which the present femur affords of the affinity of the *Macrauchenia* to the anisodactyle modification of the *Pachydermal* type, is the presence of a third trochanter. Of the *Pachyderms* which have this characteristic structure, the extinct Palæothere offers the nearest resemblance to the *Macrauchenia* in the general form and structure of the femur.

But the femur of *Maerauchenia*, in the flatness of the back part of its neck, and the elongated form of the post-trochanterian depression, resembles that of the Camel rather than that of the Palæothere; and the same resemblance is shown in the cylindrical figure, straightness and length of the shaft. The depth of the trochanterian depression, and the incurvation of the strong ridge continued downwards from the great trochanter, are individual peculiarities in the *Maerauchenia*.

In the general form and relative size of the condyles of the distal extremity of the femur, the *Macrauchene* is intermediate between the Camel and Palæothere, but more resembles the latter. In the articular surface for the patella it deviates somewhat from the Palæothere, having this part longer in proportion to its breadth, more regularly and deeply concave from side to side, and with its lateral boundaries more sharply defined.

948. The proximal extremities of the ankylosed tibia and fibula of the right leg of the *Macrauchenia patachonica*.

From the tertiary deposits of Port St. Julian, Patagonia.

Presented by Charles Darwin, Esq., F.R.S.

949. The distal ankylosed extremities of the same tibia and fibula.

Presented by Charles Darwin, Esq., F.R.S.

In the structure of the bones of the leg of the *Macrauchenia* we find the same transitional character between the Pachydermal and Ruminant types which is afforded by the definable limits of the ankylosed bones of the fore-arm. In the Pachyderms the fibula is an entire and distinct bone: in the Ruminants, with the exception of the small Musk Deer, and in an inferior degree the Elk, the fibula appears only as a short continuous process sent down from the under part of the external condyle of the tibia, its distal end being represented by a detached ossicle: in the Camel tribe the proximal process is in a still more rudimental state. In the *Maerauchenia* the fibula is entire, but is confluent with the tibia through nearly its whole extent; the proximal part of the fibula is well defined: its head is ankylosed to the outer condyle of the tibia, but the shaft is continued free for the extent of nearly two inches, and then again becomes confluent with the tibia, forming apparently the outer ridge of that bone.

About five inches from the distal end of the tibia this outer ridge becomes flattened by being, as it were, pressed against the tibia, and the anterior and posterior edges are raised above the level of the tibia: beyond this part the limits of the fibula begin again to be defined by deep vascular grooves. The outer side of the distal end of the fibula is excavated by a broad tendinous groove. The fibula and tibia are distinct bones in both the Palæotheres and Anoplotheres, as in the existing Pachyderms.

950. The right astragalus of the *Macrauchenia patachonica*. It is with the Pachyderms having three toes to the hind-foot that the *Macrauchenia* agrees in the most important characters of the present instructive bone; its anterior or scaphoidal surface, for example, is simple and not divided into two equal or subequal facets by a vertical ridge, as in the isodactyle Pachyderms: and it is with the astragalus of the Tapir and Palæothere that it presents the closest correspondence in the general form and minor details of structure.

If the upper or tibial articular surface be compared with that in the *Palæotherium magnum*, it will be seen that the general direction of that surface is more parallel with the axis of the bone in *Macrauchenia*. In the *Palæotherium* it is turned a little towards the outer or fibular side, and in the Tapir the general direction of the same surface is placed still more obliquely. The anterior border of this articulating surface is broken by a semicircular notch in the Palæothere: in the Tapir it describes a gentle concave curve, and the *Macrauchenia* resembles the Tapir in this respect. The chief difference between the astragalus of the Tapir and the Palæothere, when viewed from above, obtains in the relative length of the bone anterior to the tibial articulating surface: the *Macrauchenia* presents in this respect an intermediate structure, but differs from both in the greater extent of the tibial side of this part of the astragalus.

From the tertiary deposits of Port St. Julian, Patagonia.

Presented by Charles Darwin, Esq., F.R.S.

951. A metatarsal bone of the *Macrauchenia patachonica*.

From the tertiary deposits of Port St. Julian, Patagonia.

Presented by Charles Darwin, Esq., F.R.S.

952. A small fragment, with part of the last molar tooth, of a nondescript Pachyderm. The crown of the tooth is invested with enamel, and is traversed longitudinally down the middle of one side by a deep angular groove, and on the opposite side, but nearer one end of the tooth, by a concave canal gradually widening as the tooth descends. The enamel lining this depression is extremely thin: it forms a projecting ridge along the end of the crown near this depression, and a similar ridge at the opposite end of the tooth: the surface of the enamel is minutely wrinkled.

From the tertiary deposits at Bahia Blanca, near Patagonia.

Presented by Charles Darwin, Esq., F.R.S.

Genus *Equus*.

953. The skull of a species of *Equus* as large as that of a Horse of fourteen hands and a half high.

From Dunschaughlin Bog, Ireland.

Presented by the Earl of Enniskillen, D.C.L.

954. A posterior inferior molar of a small species of *Equus*.

From the Crag at Walker's Cliff, Norfolk.

Hunterian.

955. An inferior molar of a species of *Equus*.

From the drift deposits at Iffley.

Hunterian.

955'. The inferior molar of a recent Horse, placed by Mr. Hunter by the side of the preceding fossil to illustrate its nature.

Hunterian.

956. An inferior molar of a species of *Equus*, the crown of which has almost entirely been abraded and the fangs are elongated.

From the drift deposits at Iffley.

Hunterian.

957. The proximal phalanx of the right fore-foot of a species of *Equus*.

Locality unrecorded.

Hunterian.

958. A middle molar, right side, upper jaw, of a small-sized Horse or species of *Equus*.

From the cave called Kent's Hole, Torquay, Devon.

Presented by Gerard Smith, Esq.

959. The last molar, left side, upper jaw, of a small-sized species of *Equus*.
From Kent's Hole, Torquay. *Presented by Gerard Smith, Esq.*
960. A middle molar, left side, lower jaw, of a small-sized species of *Equus*.
From Kent's Hole, Torquay. *Presented by Gerard Smith, Esq.*

The following fossil remains, from 961 to 1116 inclusive, of a Horse, or of an animal of the genus *Equus*, most of which indicate species about fourteen hands high, were discovered by Joseph Whidbey, Esq., Civil Engineer, in the cavernous fissures at Oreston, near Plymouth, and were presented, through Sir John Barrow, Secretary to the Admiralty, to the Royal College of Surgeons. They form part of the specimens referred to by Dr. Buckland in the 'Reliquiæ Diluvianæ,' pp. 72, 73 and 75, "Horse, about twelve, of different ages and sizes, as if from more than one species:" in which work will be found a full description of the caverns in the Oreston limestone. Cuvier was unable to fix upon any characters in the fossil remains of the genus *Equus* which he examined, proving them to be specifically distinct from the existing Horse: he merely remarks that the bones are not so large as those of our large Horses, but more approaching the size of those of the Zebra. Unequivocally distinct species have since been determined by fossil remains discovered in tertiary strata in Germany and India.

961. The third or outer incisor, left side, upper jaw, of a species of *Equus*: the inverted cone of enamel, or 'mark,' which penetrates the crown of the tooth had not been worn away when the animal perished. The outer angle of the tooth is more produced than in the corresponding recent tooth of the Horse compared with the fossil.
962. The left upper canine of a species of *Equus*.
963. The first molar, right side, upper jaw, of a species of *Equus*: the central enamel islands are rather more plicated than in the recent Horse, but the anterior angle of the crown is as much produced.
964. The second molar, right side, upper jaw, of a species of *Equus*. It is remarkably distinguished from the corresponding tooth in the recent Horse by the more complicated and elegant plications of the central islands of the enamel, as also by the greater proportional antero-posterior diameter of the crown.

965. The fourth molar, right side, upper jaw, of a species of *Equus*: this tooth, in its proportions and in the plications of its enamel, resembles the corresponding tooth of the recent Horse.
966. The last molar, right side, upper jaw, of a species of *Equus*: it has been nearly worn down to the root, whereby part of the central inflected folds of enamel are obliterated, and the common dentinal base is exposed.
967. The first molar, left side, upper jaw, of a species of *Equus*. The enamel surrounding the central islands of cement, and especially the anterior one, has more complicated foldings than in the recent Horse, and the anterior angle of the crown is less produced.
968. The second or third molar, left side, upper jaw, of a species of *Equus*. The central isles of enamel are rather more plicated, but the whole crown has its antero-posterior extent longer in proportion to its transverse diameter than in the recent Horse's tooth compared.
969. The fifth molar, left side, upper jaw, of a species of *Equus*: this tooth agrees both in form and disposition of the enamel with the corresponding tooth in the recent Horse.
970. The last molar, left side, upper jaw, of a species of *Equus*. It differs from the corresponding tooth of the recent Horse in a deeper inflection of the posterior longitudinal fold of enamel, which gives a bilobed termination to the grinding surface of the tooth at that part: the posterior internal angle of the second enamel island is also detached and forms a separate cylinder in the fossil.
971. The first or mid-incisor of the right side, lower jaw, of a species of *Equus*.
972. The first or mid-incisor of the left side, lower jaw, of a species of *Equus*.
These teeth are apparently from the same individual; the central inflected cone of enamel or 'mark' has been worn to the bottom in both.
973. The first or mid-incisor of the left side, lower jaw, of a species of *Equus*: the crown has been worn down to the fang and the mark obliterated, showing it to have belonged to an 'aged' individual.
974. The third or outer incisor, right side, upper jaw, of a species of *Equus*.

975. The left lower canine of a species of *Equus*.
976. The first molar, right side, lower jaw, of a species of *Equus* : it presents a proportionally shorter antero-posterior diameter than in the recent Horse.
977. The second molar, left side, lower jaw, of a species of *Equus* : the enamel is rather more plicated and the antero-posterior extent of the crown relatively greater than in the recent Horse. The internal median inflection of enamel is double in the present specimen.
978. The third molar, left side, lower jaw, of a species of *Equus* : it manifests the same differential characters, compared with the recent Horse, as does the preceding specimen.
979. The last molar, left side, lower jaw, of a species of *Equus* : the posterior angle of the crown is less produced than in the recent Horse.

The following specimens of teeth are from the lower jaw of an aged Horse ; the crown in each having been worn down to the fangs, which are elongated.

980. The fourth molar of the right side.
981. The fifth molar of the right side.
982. The sixth and last molar of the right side.
983. The fourth molar of the left side.
984. The fifth molar of the left side.
985. A middle lower molar with the central folds of enamel quite obliterated and worn down to a common dentinal base, which has become smooth by friction.
986. The fractured atlas of a species of *Equus*.
987. The vertebra dentata, with most of its processes broken off, of a species of *Equus*.
988. The second dorsal vertebra of a species of *Equus*.
989. A portion of the os sacrum of a species of *Equus*.
990. The vertebral extremity of one of the anterior ribs of the right side of a species of *Equus*.

991. The sternal end of a rib of a species of *Equus*.
992. The sternal end of a rib of a species of *Equus*.
993. A portion of the left scapula of a species of *Equus*, including the coracoid process and the glenoid cavity.
994. A similar but smaller portion of the left scapula of the same species of *Equus*.
995. The proximal extremity of the right ulna of a species of *Equus*.
996. The proximal extremity of the left ulna of a species of *Equus*.
997. The right metacarpal bone of a species of *Equus*.
998. The right os pisiforme of a species of *Equus*.
999. The left os pisiforme of apparently the same individual.
1000. A fragment of the right os innominatum including the acetabulum of a species of *Equus*.
1001. The head of the right femur, in the condition of a detached epiphysis, of a species of *Equus*.
1002. The right patella of a species of *Equus*.
1003. The right tibia of a moderate-sized Horse or species of *Equus*.
1004. The right astragalus of a species of *Equus*.
1005. The left astragalus of apparently the same individual.
1006. The left os calcis of a species of *Equus*.
1007. The sesamoid bone which plays behind the distal joint of the foot, called the navicular or nut-bone, of a species of *Equus*.
1008. The right os cuboides of a species of *Equus*.
1009. The left os cuboides apparently of the same individual.
1010. The right metatarsal bone of a species of *Equus*.
1011. The left metatarsal bone of a species of *Equus*.
1012. The left metatarsal bone, wanting the distal extremity, of a species of *Equus*.

1013. The proximal phalanx or great pastern bone of a species of *Equus*.
 1014. The middle phalanx or small pastern bone of a species of *Equus*.
 1015. The ungual phalanx or coffin-bone of a species of *Equus*.
 1016. The proximal phalanx of a species of *Equus*.
 1017. The middle phalanx of a species of *Equus*.
 1018. The left os calcis of a moderate-sized Horse or species of *Equus*: it is coated with stalactite.

From the Hyæna-cave at Kirkdale, Yorkshire.

Presented by John Gibson, Esq., F.G.S.

1019. The second incisor, left side, lower jaw, of a species of *Equus*. It shows the 'mark' and thus indicates a young individual.

From the drift gravel, above the chalk, at Hessle, near Hull.

Presented by William Spence, Esq., F.R.S.

1020. The last molar, left side, upper jaw, of a species of *Equus*. The posterior longitudinal fold of the enamel is rather deeper than in the corresponding tooth of the recent Horse compared; in other respects the teeth closely agree.

From the drift gravel, above the chalk, at Hessle, near Hull.

Presented by William Spence, Esq., F.R.S.

1021. The right tibia of a small species of *Equus*.

Locality unrecorded.

Hunterian.

1022. The distal phalanx or coffin-bone of a species of *Equus*.

From a gravel-pit in Lincolnshire.

Presented by Dr. Richardson, F.R.S.

Equus Asinus.

1023. A middle molar, left side, upper jaw, of a species of *Equus*, of the size of a large Ass.

From the drift above the London clay, at Deptford.

Presented by Sir Everard Home, Bart., F.R.S.

1024. The crown of a middle molar, right side, upper jaw, of a species of *Equus*, about the size of the Ass.

From the pleistocene freshwater deposits at Grays, Essex.

Presented by Wm. Ball, Esq., F.G.S.

1025. The last molar, left side, upper jaw, of a species of *Equus*, of the size of the Ass.

From the drift at Kessingland, Suffolk.

Presented by Wm. Ball, Esq., F.G.S.

1026. The third molar, left side, lower jaw, of a species of *Equus*, of the size of the Ass.

From a pleistocene freshwater deposit in Essex.

Presented by Wm. Ball, Esq., F.G.S.

1027. The right astragalus of a small species of *Equus*, probably an Ass.

From the ancient landslip of Bonchurch, Isle of Wight.

Presented by Dr. Richardson, F.R.S.

Equus Sivalensis.

1028. The symphysial end of the lower jaw with two of the incisors and the sockets of the remaining incisors and of the canines of the extinct Sewalik Horse (*Equus Sivalensis*, Falconer).

From the tertiary deposits of the Sub-Himalayan district, India.

Presented by Thomas Bacon, Esq.

1029. A portion of the upper jaw of the extinct Sewalik Horse (*Equus Sivalensis*), with the three deciduous molar teeth on each side, and the intervening palate: the fourth molar, the first of the series of true molars, had just begun to cut the gum.

From the tertiary deposits of the Sub-Himalayan district, India.

Presented by Thomas Bacon, Esq.

1030. A middle molar, left side, upper jaw, of a species of Horse (*Equus curvidens*, Owen). It has a greater relative antero-posterior diameter than in the recent Horse, but differs more especially in the greater degree of incurvation of the entire tooth.

The specimen is completely fossilized, and was discovered, with the remains of the Mylodon, Megatherium, and other extinct animals, in the tertiary deposits at Punta Alta, Bahia Blanca, South America, by the

Donor, Charles Darwin, Esq., F.R.S.

1031. A middle molar, left side, upper jaw, of the same species of Horse (*Equus curvidens*).

This tooth was discovered in the red argillaceous earth of the Pampas at Bajada de Santa Fé, in the province of Entre Rios, South America. It agrees so closely in colour and condition with the remains of the Mastodon and Toxodon from the same locality, as to leave no room for doubt respecting the contemporaneous existence of the individual Horse to which it belonged

Presented by Charles Darwin, Esq., F.R.S.

Genus *Hippopotamus*.

1032. The tip of the left external inferior incisive tusk of a fossil Hippopotamus. It was found associated with the molars of a large Ox or Aurochs.

Locality unrecorded. *Hunterian.*

1033. The extremity of the right upper canine of the *Hippopotamus major*, Cuvier; it is imbedded in a mass of breccia.

Locality unrecorded. *Hunterian.*

1034. The external wall of the right inferior canine or tusk of a young individual of the *Hippopotamus major*, Cuvier.

Locality unrecorded. *Hunterian.*

1035. The internal wall of apparently the same tusk.

Locality unrecorded. *Hunterian.*

1036. A much-worn crown of an upper molar of the *Hippopotamus major*, Cuv.

Locality unrecorded. *Hunterian.*

1037. The anterior part of a lower molar of the *Hippopotamus major*, Cuvier.

Locality unrecorded. *Hunterian.*

1038. The crown of the last molar, left side, lower jaw, of the *Hippopotamus major*: it has a longer antero-posterior diameter, as compared with the transverse diameter, than in the existing *Hippopotamus amphibius*.

Locality unrecorded.

Hunterian.

1038¹. The last molar, left side, lower jaw, of the recent *Hippopotamus* for comparison with the fossil.

Hunterian.

1039. The crown of the last molar, right side, lower jaw, of the *Hippopotamus major*, Cuvier.

From the freshwater deposits overlying the fluviomarine crag at Cromer, Norfolk.

Presented by Miss Hannah Gurney.

1040. The cast of a penultimate lower molar of the *Hippopotamus major*, Cuv.

From the freshwater deposits near Happisburgh, Norfolk.

Presented by Robert Fitch, Esq., F.G.S.

1040¹. A penultimate lower molar of the recent *Hippopotamus*, for comparison.

1041. The right large median incisive tusk of the *Hippopotamus major*, Cuv.

It has lost much of its original animal matter and is considerably decomposed. This tusk when entire must have measured eighteen inches in length. It is the original specimen, described in Parkinson's 'Organic Remains,' vol. iii. p. 375, as having been obtained from the Till at Walton in Essex.

Mus. Parkinson.

1042 A portion of the apical extremity of the left lower canine tusk of the *Hippopotamus major*, Cuvier.

From the pleistocene Till at Walton, Essex.

Mus. Parkinson.

It is thus described by Mr. Parkinson:—"The point of an inferior canine tooth or tusk, measuring full nine inches in circumference, and having seven inches in length of triturating surface. From the great size of this tooth, it is very likely to have belonged to the same animal to which the preceding tooth (No. 1041) belonged. Besides the longitudinal striæ and grooves observable in the enamel of its sides and inferior part, it is characterized by strong transverse rugous markings,

which are placed at nearly regular distances of about two inches ; and are observed to exist in the same manner on the fragment (No. 1043) which joins to it.”—*Organic Remains*, vol. iii. p. 375.

1043. The inner wall, with its enamel, of the same left inferior canine of the *Hippopotamus major*, Cuvier.

From the Till at Walton, Essex.

Mus. Parkinson.

1044. A fragment of the left lower canine of the *Hippopotamus major*, Cuvier. It is from a young individual, and had scarcely come into use ; the pulp-cavity extends to near the apex of the conical and unworn crown.

Mr. Parkinson describes this specimen as follows :—“ A fragment of a tusk or lower canine tooth which is only about half the size of the preceding specimen. It has the markings of its enamel of a different character from that of the larger tooth, and particularly is devoid of those transverse rugous markings, which are so strongly formed in that specimen. From the roundness of this specimen in its circumference, and from the difference of its character, I am led to suspect that it may have belonged to the small Hippopotamus, which, as will be presently observed, was discovered by Cuvier, and which is only as yet known in a fossil state.”—*Organic Remains*, vol. iii. p. 376. The characters cited by the author are explicable on the immaturity of the specimen.

From the Till at Walton, Essex.

Mus. Parkinson.

1045. The third premolar, right side, upper jaw, of the *Hippopotamus major*, Cuv. The specimen was dug up in a field called Burfield in the parish of Leigh, five miles west of Worcester.

Presented by Sir Everard Home, Bart., F.R.S.

1046. The anterior part of the first true molar, left side, lower jaw, of the *Hippopotamus major*, Cuvier.

From the Hyæna-cave at Kirkdale, Yorkshire.

Presented by John Gibson, Esq., F.G.S.

The specimens of the *Hippopotamus minor*, Nos. 1047 to 1059 inclusive, are those referred to in the following Memorandum transmitted with them by the

Donor, J. Morrison, Esq.

“From the village of Sferra Cavallo, at the western extremity of the valley of Palermo, the road leads round a cape into another smaller plain, but in many respects similar to that of Palermo, bounded by the Mediterranean towards the N.W. and on the land side by a semicircular range of high calcareous mountains.

“At the bottom of this valley, and on a rock rising to a considerable elevation, stand the ancient town and castle of Carini. Looking down from the castle in the direction of the sea, there is seen near the foot of the range of mountains, on the western side, a line strongly marked, indicating the limit at some former period of the sea; judging by the eye, this line is on the same level with that of the caves of Santo Ciro and Belenic in the adjoining valley of Palermo.

“In several places along this supposed watermark are found large quantities of bones; yet a fact so interesting, although known for many months, appears to have excited no attention either on the part of the curious or of the learned.

“At one point there is a large cave filled to the depth of ten or twelve feet with a dark soil mixed with bones much broken, and which in the course of this year have almost all been picked out and sold with modern bones for exportation to France. It would be impossible now to ascertain how these lay, and what state they were in previous to being disturbed; they appear to have been much less petrified than those of which mention is made hereafter, although from their similarity it may be safely assumed that they are of the same date.

“At another point, but exposed to the weather and covered merely by a little earth and fragments of rock fallen from the overhanging mountain, were found the remains that accompany the present; these and some hundredweight more were all taken up from a space not more than six or eight feet square, and chiefly from under one fragment of rock, and it is more than probable that under the superintendence of one at all versed in these matters, the whole skeleton of the animal to which the head and larger bones belong might have been obtained.”

1047. A considerable proportion of the skull of a *Hippopotamus medius*, Cuv.
Presented by J. Morrison, Esq.
1048. A portion of the left ramus of the lower jaw, with the beginning of the characteristic descending angle, and the last molar and part of the penultimate molar tooth, of the same Hippopotamus.
Presented by J. Morrison, Esq.
1049. Two superior molar teeth of the same Hippopotamus, one of them much worn, cemented to a mass of breccia.
Presented by J. Morrison, Esq.
1050. The crown of the antepenultimate molar, left side, lower jaw, of the same Hippopotamus.
Presented by J. Morrison, Esq.
1051. Crown of the penultimate molar, left side, lower jaw, of the same Hippopotamus.
Presented by J. Morrison, Esq.
1052. The crown of the penultimate molar, right side, lower jaw, of the same Hippopotamus.
Presented by J. Morrison, Esq.
1053. The fourth cervical vertebra of the same Hippopotamus.
Presented by J. Morrison, Esq.
1054. The fourth metacarpal bone of the right fore-foot of the same Hippopotamus.
Presented by J. Morrison, Esq.
1055. The fifth metacarpal bone of the right fore-foot of the same Hippopotamus.
Presented by J. Morrison, Esq.
1056. The left acetabulum of the same Hippopotamus.
Presented by J. Morrison, Esq.
1057. The distal end of the left femur of the same Hippopotamus.
Presented by J. Morrison, Esq.
1058. The right astragalus of the same Hippopotamus.
Presented by J. Morrison, Esq.
1059. The left os calcis of the same Hippopotamus.
Presented by J. Morrison, Esq.
1060. The crown of a molar of the smaller extinct species of Hippopotamus (*Hippopotamus medius*, Cuvier).
Locality unrecorded. *Hunterian.*

The following specimens of the *Hippopotamus medius*, No. 1061 to 1067 inclusive, are from the tertiary deposits of Candia, Greece, and were presented by Captain Graves, R.N., of H.M.S. Beacon.

1061. The crown of the fourth molar, or the last premolar, left side, upper jaw, of the *Hippopotamus medius*.
1062. The crown of the fourth molar, right side, upper jaw, of the same Hippopotamus.
1063. The crown of the fifth or antepenultimate molar, or first true molar, of the right side, upper jaw, of the same Hippopotamus.
1064. The crown of the fifth molar, left side, upper jaw, of the same Hippopotamus.
1065. The crown of the last molar, left side, lower jaw, of the *Hippopotamus medius*. It has been moderately worn by mastication before the individual perished.
1066. The crown of the last molar, left side, lower jaw, of the *Hippopotamus medius* : it has been rather more worn.
1067. The crown of the last molar, right side, lower jaw, of the *Hippopotamus medius* : its summits are entire.

Genus *Hexaprotodon*.

1068. The posterior part of the skull of the *Hexaprotodon Sivalensis*, Falconer and Cautley ; with the three posterior molar teeth on each side.

From the tertiary formations of the Sewalik Hills in the Sub-Himalayan district, India. *Presented by the Rev. E. Everest, M.A.*

1069. The expanded symphysial end of the lower jaw of the *Hexaprotodon Sivalensis*, showing the six incisive teeth (dentes primores) characteristic of the genus, and the two canines : the crowns of all these teeth have been broken off very near their sockets.

1070. A portion of the left ramus of the lower jaw, including the three posterior molar teeth, of the *Hexaprotodon Sivalensis*.

Presented by the Rev. E. Everest, M.A.

1071. A portion of the right upper maxillary bone, with the last premolar and the first true molar tooth, of the *Hexaprotodon Sivalensis*.

Presented by the Rev. E. Everest, M.A.

1072. The crown of an upper molar of the *Hexaprotodon Sivalensis*.

From the tertiary formations of the Sewalik Hills. *Purchased.*

1073. The crown of an upper molar of the *Hexaprotodon Sivalensis*.

From the tertiary formations of the Sewalik Hills. *Purchased.*

1074. A portion of the crown, with the abraded extremity of the left upper incisor, of the *Hexaprotodon Sivalensis*.

From the tertiary formations of the Sewalik Hills. *Purchased.*

1075. The protruded and abraded extremities of the upper and lower canine tusks of the right side of the *Hexaprotodon Sivalensis*.

From the tertiary formations of the Sewalik Hills.

Presented by Thomas Bacon, Esq.

Genus *Anthracotherium*.

1076. A cast of a fragment of the right ramus of the lower jaw, with the penultimate and last molar teeth, of the *Anthracotherium magnum*, Cuvier. The jaw is remarkable for its great thickness as compared with its depth, but there is an indication of a descending process leading from the back part of the fragment towards the angle, which calls to mind the peculiar form of the lower jaw in the Hippopotamus. The penultimate molar supports four pointed eminences, a little worn by mastication; the last molar has an additional bifid tubercle or lobe posteriorly, as in the Hippopotamus.

The original of this cast was discovered in the lignite beds near

Cadibona, a village at the foot of the great Apennine Chain, and is described and figured in the 'Ossemens Fossiles,' ed. 1822, tom. iii. p. 398, pl. lxxx. fig. 2. *Presented by Baron Cuvier.*

Genus *Sus*.

1077. Two of the inferior incisors of a Wild Boar (*Sus scrofa*, Linn.).

Locality unrecorded.

Hunterian.

1078. The right and left lower canines of the same Wild Boar.

These specimens and the quantity of hazel nuts preserved with them, were transmitted to Mr. Hunter by Mr. Jones, with the following memorandum :—

“ Dear Sir,

“ The under jaw of a Wild Boar or some other animal and the nuts, which I have taken the liberty to inclose in the box, were a few days since found about ten feet under ground by a labourer as he was digging peat or turf.

“ Several single tusks have been found, and they were all worn in the manner you will observe these to be at the extremities ; and the quantity of nuts were very considerable : they seemed to lay in a layer of white sand between the strata of peat. From whence could they come ? Is it possible they could remain there ever since the Deluge ?

(Signed) “ W. JONES.”

“ Abingdon, Berks,
May 23rd, 1787.”

“ The layer of sand and nuts extended upwards of eighteen feet horizontally.”

1079. The left inferior tusk of a Wild Boar (*Sus scrofa*). It was exhumed eight or ten feet from the surface, out of the peat-meadows, half a mile west of Newbury in Berkshire.

Presented by Mr. Alexander, Surgeon, Newbury.

A good account of this locality, under the name of the ' Peat-pit near Newbury,' is contained in a Letter dated February 24th, 1757, from

Dr. John Collet to the Bishop of Ossory, F.R.S., which is printed in the Philosophical Transactions for the year 1757, p. 109. In the list of organic remains are included "A great many horns, heads, and bones of several kinds of Deer, the horns of the Antelope, the heads and *tusks of Boars*, the heads of Beavers, &c."

It is most probable that the specimens Nos. 211 and 212, the latter of which is recorded to have been found in a moss-pit in Berkshire, are from the celebrated peat deposit at Newbury.

Genus *Chæropotamus*.

1080 A cast of the mutilated basis cranii and upper jaw of the *Chæropotamus Cuvieri*, Owen. It demonstrates the two glenoid articular surfaces, which are flat as in the Peccari; the two zygomatic arches, which also resemble those of the Peccari in their great width and rectilinear direction: the specimen likewise exhibits the posterior part of the palate, the pterygoid processes, the three posterior or true molars on each side, three of the four premolar teeth, the second being absent on the right side and the third on the left side. A part of the orbit is preserved on one side, demonstrating the position of the eye.

The two anterior premolars are separated by a vacant space and have simple compressed crowns, the fourth and fifth have each two tubercles and a basal ridge. The crowns of the true molars are square-shaped and support four principal tubercles in two transverse pairs, with a smaller one at the interspace of each pair, the whole being surrounded by a strong basal ridge.

From these characters Cuvier established a new genus of Pachyderms more nearly allied to the Hog-family than to the Anoplotherium. The *Chæropotamus* apparently bore a close affinity to the Anthracotherium, by which it was connected with the Hippopotamus.

The original of this cast was discovered in the Eocene gypsum quarries at Montmartre, and is described in the 'Ossemens Fossiles,' ed. 1822, tom. iii. p. 262. pl. lxxviii.

Presented by the Professors of the Garden of Plants, Paris.

1081. A cast of the right ramus of the lower jaw of the *Chæropotamus Cuvieri*.
From the Eocene freshwater deposits at Binstead, Isle of Wight.

Presented by the Rev. C. Darwin Fox, M.A.

The condyloid process in the *Chæropotamus* is raised higher above the angle of the jaw than in the true Carnivora, and it is less convex than in the Hog, agreeing with the shape of the articular surface in the upper jaw demonstrated by the Parisian specimen of the present rare extinct *Pachyderm*. In the size of the coronoid process the *Peccari* exceeds the true Hogs; and in that respect, as well as in the form and position of its canine teeth, makes a nearer approach to the carnivorous type: but in the *Chæropotamus* the coronoid process is still more developed in correspondence with the greater bulk of the temporal muscle, the size of which is indicated by the span of the zygomatic arches; and the angle of the jaw is produced backwards. In the wavy outline of the inferior border of the lower jaw, the *Peccari* alone amongst the Hog tribe resembles the *Chæropotamus*. The two detached molars of the lower jaw described by Cuvier, *loc. cit.* p. 261, and which he compares with the third and fourth molars of the *Babyroussa*, are shown by the present specimen to be the fourth and fifth, or penultimate and antepenultimate molars, counting backwards, of the *Chæropotamus*, and correspond with the penultimate and antepenultimate grinders of the *Peccari*. The last molar of the lower jaw in both the *Peccari* and *Babyroussa* differs from the preceding in having two accessory, smaller and more closely approximated tubercles at the posterior part of the tooth, with a third small tubercle in the middle of the interspace between these and the next pair of tubercles.

In the present specimen the last molar of the lower jaw of the *Chæropotamus* presents the same additional posterior tubercles as in the *Peccari*, and thus corroborates the conclusions of Cuvier as to the affinities of the present extinct genus to the existing members of the Hog-tribe. The other teeth correspond in every respect with the description and figures in the 'Ossemens Fossiles'; but the fossil here described yields another fact essential in characterizing the genus, and which the fragments in Cuvier's possession were too imperfect to afford, viz. the

exact number of molar teeth in the lower jaw, which is twelve : of these the three posterior teeth on each side are tuberculate or true molars ; and the three anterior ones are compressed and conical, or false molars ; the latter have each two roots and are relatively larger than in the Hog-tribe. The tooth anterior to the grinders, and which from its shape Cuvier regarded as a canine, is situated closer to the symphysis of the jaw than in any of the existing *Suidæ* : but the Peccari in this respect also comes nearest to the Chæropotamus. The grinders, as in the Peccari, are narrower in the lower than in the upper jaw. On the outer surface of the jaw, near its anterior extremity, the vascular foramina are as numerous as in the jaws of the Hog-tribe.

Genus *Hyracotherium*.

1082. The skull, without the lower jaw, of the *Hyracotherium leporinum*, Owen.

This unique specimen was discovered in the Eocene or London Clay at Herne Bay. *Presented by William Richardson, Esq., F.G.S.*

The molars are seven in number on each side, and resemble more nearly those of the Chæropotamus than the molars of any other known genus of existing or extinct Mammalia. They consist of four spurious molars or premolars, and three true molars. The first and second premolars, counting from before backwards, have simple subcompressed crowns, surmounted by a single median conical cusp with a small anterior and posterior tubercle at the outer side, and a ridge along the inner side of its base : they are separated from each other by an interspace nearly equal to the antero-posterior diameter of the first molar, which measures two lines and a half. The second and the remaining molars are in close juxtaposition. The third and fourth false molars present a sudden increase of size and of complexity of the grinding surface, with a corresponding change of form. The plane or transverse section of the crown is subtriangular with the base outwards and nearly straight, the apex inwards and a little forwards, rounded off, to which the anterior and posterior sides converge in curved lines ; the grinding surface sup-

ports three principal tubercles or cusps, two on the outer and one on the inner side; there are two smaller elevations, with a depression on the summit of each situated in the middle of the crown, and the whole is surrounded with a ridge, which is developed into a small cusp at the anterior and external angle of the tooth. These teeth form the principal difference between the dentition of the present genus and that of the *Chæropotamus*, in which the corresponding false molars are relatively smaller and of a simpler construction, having only a single external pyramidal cusp with an internal transverse ridge or talon at its base. The true molars, three in number on each side, closely correspond in structure with those of the *Chæropotamus*. They present four principal conical tubercles situated at near the four angles of the quadrilateral grinding surface.

Each transverse pair of tubercles is connected at the anterior part of their base by a ridge, which is raised midway into a smaller conical tubercle with an excavated apex. The crown of the tooth is surrounded by a well-marked ridge, which is developed, as in the third and fourth false molars, into a sharp-pointed cusp at the anterior and external angle of the tooth. The hindmost molar is more contracted posteriorly, and its quadrilateral figure less regular than the two preceding molars.

The sockets of the canines or tusks indicate that these teeth were relatively as large as in the *Peccari*; and that they were directed downwards as in that species, and as most probably also in the *Chæropotamus*. The temporal muscles were as well developed as in the *Peccari*, the depressed surface for their attachment extending on each side of the cranium as far as the sagittal suture.

The frontal bones are divided by a continuation of the sagittal suture. The nasal suture runs transversely across the cranium parallel with the anterior boundary of the orbits.

The lachrymal bone reaches a very little way upon the face. The external angle of the base of the nasal bone, which is of considerable breadth, joins the lachrymal, and separates the superior maxillary from the frontal bone. The anterior margin of the molar bone encroaches a little way upon the face at the anterior boundary of the orbit.

The under surface of the palatal process of the maxillary bones is rugose, as in the Peccari; the portion of the skull, including the intermaxillary bones and the incisive teeth, is unluckily broken off and lost. That the eye was full and large, is indicated by the size of the optic foramen and the capacity of the orbit, the vertical diameter of which equals one inch.

The upper part of the cranium anterior to the sagittal suture is slightly convex from side to side; its longitudinal contour is nearly straight. The face gradually becomes narrower anteriorly; it is slightly concave at the sides.

The general form of the skull was probably intermediate in character between that of the Hog and the Hyrax. The large size of the eye must have given to the physiognomy of the living animal a resemblance to that of the Hare and other timid Rodentia.

1083. A dorsal vertebra of a small mammiferous quadruped, agreeing in size with the *Hyracotherium leporinum*, and from the same stratum and locality. *Presented by William Richardson, Esq., F.G.S.*

Genus *Anoplotherium*.

1084. A portion of the alveolar series of the left ramus of the lower jaw of the *Anoplotherium commune*, Cuvier, with five of the molar teeth *in situ*: the inner surface of their crowns are exposed to view.

The specimen is imbedded in a block of gypsum, and is most probably from the quarries at Montmartre. *Hunterian.*

1085. A portion of the left ramus of the lower jaw, with the penultimate and part of the antepenultimate and last molars *in situ*. It is imbedded in a block of gypsum.

From the Eocene quarries at Montmartre.

1086. A cast of the skull, in profile relief, of the *Anoplotherium commune*, with the series of teeth complete in both the upper and lower jaws.

The temporal fossæ are long and meet above at a sagittal ridge: the orbit is bounded by a descending post-orbital process. The teeth include three incisors, one canine, and seven molars on each side of both jaws: the canines are smaller than the first premolar, and do not project beyond the level of the other teeth; but these form one unbroken series, as in the Human Subject; no Mammalian animal, existing or extinct, resembles Man in this character, except the *Anoplotherium*: the name* implies the harmless nature of the beast, which was unprovided with horns, tusks, claws, or any other instrument of offence.

Presented by Prof. de Blainville.

The following casts of the bones of the *Anoplotherium*, from No. 1087 to No. 1103 inclusive, belong to the same right fore-foot, and were presented to the College by Baron Cuvier.

- 1087. The right scaphoid bone of the *Anoplotherium commune*.
- 1088. The right semilunar bone of the *Anoplotherium commune*.
- 1089. The right cuneiform bone of the *Anoplotherium commune*.
- 1090. The right pisiform bone of the *Anoplotherium commune*.
- 1091. The right trapezium of the *Anoplotherium commune*.
- 1092. The right trapezoides of the *Anoplotherium commune*.
- 1093. The right os magnum of the *Anoplotherium commune*.
- 1094. The right unciform bone of the *Anoplotherium commune*.
- 1095. A rudimental metacarpal bone of the right inner toe of the right fore-foot of the *Anoplotherium commune*; it corresponds with the second digit of the pentadactyle foot.
- 1096. The metacarpal bone of the innermost of the two fully developed toes of the right fore-foot of the *Anoplotherium commune*; it corresponds with the third metacarpal bone of the pentadactyle foot.

* α priv. ὄπλον weapon, θηρίον beast.

1097. The outer metacarpal bone of the two fully developed toes of the right fore-foot of the *Anoplotherium commune* ; it corresponds with the fourth metacarpal of the pentadactyle foot ; there is a small articular surface which, with an adjacent one on the os unciniforme, afforded attachment to the rudiment of the fifth metacarpal.
1098. The proximal phalanx of the inner toe of the same fore-foot of the *Anoplotherium commune*.
1099. The middle phalanx of the inner toe of the same fore-foot of the *Anoplotherium commune*.
1100. The distal or ungual phalanx of the inner toe of the same fore-foot of the *Anoplotherium commune*.
1101. The proximal phalanx of the outer toe of the same fore-foot of the *Anoplotherium commune*.
1102. The middle phalanx of the outer toe of the same fore-foot of the *Anoplotherium commune*.
1103. The distal or ungual phalanx of the outer toe of the same fore-foot of the *Anoplotherium commune*.

The originals of the foregoing casts of the bones of the fore-foot were discovered in the Eocene deposits of gypsum at Montmartre.

The first of these bones which Cuvier obtained were the semilunare, the unciniforme and the os magnum ; and the result of his comparisons was that they were intermediate in their forms between the Hog and some other Pachyderms on the one hand and the Ruminants on the other. Subsequent discoveries confirmed the earlier inductions, and demonstrated that there had been entombed in the gypsum quarries a Pachyderm with fore-feet having but two completely developed toes, the medius and the annulare, of which the metacarpal bones continued distinct throughout life ; the other toes being represented by very simple rudiments : this peculiarly constructed fore-foot was finally demonstrated to belong to the same animal as the skull with small

canines and an unbroken series of teeth (No. 1086), and to which Cuvier gave the name of *Anoplotherium commune*. See the detailed descriptions of these bones in the above-cited edition of the 'Ossemens Fossiles,' tom. iii.

1104. The head and a considerable portion of the shaft of the thigh-bone of the *Anoplotherium commune*, Cuv. ; it shows the well-developed and characteristically situated small trochanter. The specimen is partly imbedded in a block of Montmartre gypsum, from which it was relieved by the
Donor, William Clift, Esq., F.R.S.

The following casts of the bones of the *Anoplotherium*, from No. 1105 to 1117 inclusive, belong to the same left fore foot, and were presented to the College by Baron Cuvier.

1105. The astragalus of the *Anoplotherium commune*. The anterior surface is divided by a vertical ridge into two articular surfaces, more unequal than in the Hippopotamus and the Ruminantia, and less unequal than in the Hog ; it most resembles that of the Camel. Besides the broad inferior articulation with the calcaneum, it interlocks with that bone by a peculiar bent process continued from the posterior, inferior and outer angle, which Cuvier states he had not found in any other animal.
1106. The calcaneum of the *Anoplotherium commune*: it presents superiorly a convex articulation for the support of the fibula, anteriorly a surface twice as long as broad for the os cuboides, and internally two vertical articular surfaces, besides the broad horizontal one, for the astragalus. These characters, Cuvier observes, are met with only in the calcanea of the even-toed Pachyderms, as the Hippopotamus, the Hog-tribe, and the Ruminantia.
1107. The os cuboides of the *Anoplotherium commune*: it presents anteriorly a singular articular surface for a metatarsal bone, and is distinct from the scaphoid, as in the Pachyderms and Camel-tribe. In the true Ruminantia these bones are ankylosed together.

1108. The os scaphoides of the *Anoplotherium commune*: it articulates by two surfaces with the os cuboides, and presents anteriorly but one articular surface for a cuneiform bone: on the inner side of the bone just behind that surface there is a small facet indicating the existence of a second rudimental cuneiform bone.
1109. The os cuneiforme of the *Anoplotherium commune*, corresponding with the internal of the three which are found in the pentadactyle foot.
1110. The innermost of the two distinct metatarsal bones of the *Anoplotherium commune*: it corresponds with the third or middle metatarsal of the pentadactyle foot.
1111. The outermost of the two metatarsals of the *Anoplotherium commune*: it corresponds with the fourth metatarsal of the pentadactyle foot.
1112. The proximal phalanx of the innermost toe of the *Anoplotherium commune*.
1113. The middle phalanx of the same toe.
1114. The distal phalanx of the same toe.
1115. The proximal phalanx of the outermost toe of the *Anoplotherium commune*.
1116. The middle phalanx of the same toe.
1117. The distal phalanx of the same toe.

The originals of the foregoing casts of the bones of the hind-foot were discovered in the Eocene deposits of gypsum at Montmartre, and are described by Cuvier in the 'Ossements Fossiles,' ed. 1822, tom. iii., who justly observes that the structure presented by this hind-foot is absolutely unknown amongst existing animals. The Ruminants alone have a didactyle hind-foot; but these, even the Camels, which resemble the *Anoplotherium* in the separation of the cuboid and scaphoid, have the metatarsal bones confluent, and forming a single bone called the "cannon-bone."

Subgenus *Dichobune*.

1118. The cast of a portion of the right ramus of the lower jaw of the *Dichobune cervinum*, Owen. This specimen, besides being larger than the corresponding part of the *Dich. leporinum* of Cuvier, differs in the form of the ascending ramus of the lower jaw, whereby it approaches nearer to the true *Anoplotherium*.

From the Eocene freshwater deposits at Binstead, Isle of Wight.

Presented by *S. P. Pratt, Esq., F.G.S.*

The original of this cast is figured, as belonging apparently to a species of *Moschus*, in the 'Geological Transactions,' vol. iii., 2nd Series, 1830, p. 151, where the strata from which the fossil was derived are described as follows:—

“The quarries at Binstead are, as is well known, situated in the lower freshwater formation, and consist of alternating beds of compact siliceous limestone, sand, and whitish shelly marl, composed almost entirely of comminuted freshwater shells. The marls are more or less indurated, and form several distinct beds separated by thin seams of clay, the lower of which contain the principal part of the fossil remains observed, although indications of the same may be seen in all the beds. These remains consist of numerous fragments of bones, scales and teeth. Most of the fragments of bone have been rounded, and they are generally so much injured as to make it difficult to class them. One specimen, however, appears to be the head of a humerus, another a bone of a foot, both probably belonging to the Pachydermata above mentioned, as they were found in connexion with the teeth. The greater number of the bones may be identified with those of the freshwater Turtle, consisting principally of remains of the carapax; and two genera at least, the *Emys* and *Trionyx*, have been observed, corresponding with those described by Cuvier as found in the Paris basin. Of the teeth, one is a molar of *Palæotherium magnum*, another agrees with the first molar of *Palæotherium minimum*, and the third is apparently part of a molar of *Anoplotherium commune*.”

Order RUMINANTIA.

Genus *Camelopardalis*.

1119. A cast of the lower jaw of the fossil Giraffe of Issoudun (*Camelopardalis Biturigum*, Duvernoy).

The original was discovered in a yellowish argillaceous stratum in the digging of a well in the town of Issoudun, and has been described and figured by Prof. Duvernoy in the 'Annales des Sciences Naturelles,' 3rd Series, tom. i. Having compared this cast, at the request of Prof. Duvernoy, with the specimens of Giraffe in the Hunterian Museum, it was found that the fossil jaw from Issoudun differed from that in the existing Giraffe, of both the Cape and Nubia, in the greater degree and regularity of the convexity of the lower margin of the ramus below the molar teeth, which was due principally to the smaller height of the ramus below the last molar as compared with its height below the second and third molars. The last molar is relatively smaller in the Issoudun fossil than in the Giraffe; the posterior lobe is also relatively smaller and more simple. The penultimate and the antepenultimate teeth are more equal in size in the Issoudun fossil. In proportion to the extent of the molar series, the fossil has a relatively shorter jaw and a shorter symphysis. The symphyseal expansion for the incisive teeth commences in the fossil immediately anterior to the outlet of the dental canal, but it commences an inch in advance of the outlet in the existing Giraffe. The length of the ramus between the first molar and the posterior commencement of the symphysis is greater in the fossil than in the existing Giraffe. The outer surface of this part of the ramus, between the molar and the symphysis, is more convex in the fossil. The concavity continued from behind the last molar upon the anterior ascending border of the coronoid process is absolutely wider and deeper in the fossil. The height of the ascending ramus from the angle to the condyloid process, as compared with the length of the molar series, is less in the fossil.

In all the foregoing points, except the relative length of the symphysis,

the fossil resembles the Elk as much as it differs from the Giraffe : in the length of the symphysis it is intermediate between the Elk and the Giraffe.

The fossil of Issoudun resembles the Giraffe and differs from the Elk in the characteristic superior breadth, or transverse diameter, of the second and third molars, and in the rugous surface of the enamel ; in the concavity of the inner surface of the ramus between the first molar and the symphysis, and in the thicker posterior margin of the ascending ramus.

From these and some minor characters the Issoudun fossil evidently approximates most nearly to the genus *Camelopardalis*, but offers striking differences from the existing species of Giraffe, and tends in these deviations towards the genus *Alces*. *Presented by Prof. Duvernoy.*

Genus *Cervus*.

Subgenus *Megaceros*.

1120. The skeleton of a gigantic Deer, commonly, but erroneously, called the 'Irish Elk' (*Megaceros Hibernicus*, Owen ; *Cervus Megaceros*, Hart : *Cerf à bois gigantesques*, Cuvier). This skeleton maintains a close correspondence with the Fallow Deer in the bones of the trunk, the number of ribs, and also in the forms and proportions of the bones of the extremities, but these are rather stronger relatively to their length. The cervical vertebræ are proportionally much larger, in relation to the great weight which they were destined to support when the antlers were fully developed. The subgeneric character and chief peculiarity of the present extinct species are manifested by the extraordinary development and the form of the antlers. The span of the antlers, measured in a straight line between the extreme tips, is eight feet ; the length of a single antler following the curve is seven feet three inches.

The rounded beam of the antler expands, sooner than in the true *Dama* or Fallow Deer, into a broad palm, which sends off all the processes or snags, save one, from its anterior border, in which respect *Megaceros* differs from *Dama* and resembles *Alces* ; it differs from the Elk in having one posterior branch or 'spiller,' and more especially in having both

brow-antler and bezantler. The Reindeer (*Rangifer*) makes the nearest approach to the *Megaceros* in the large development of the antlers, but the extinct species far surpasses all known *Cervidæ* in the enormous proportions of the antlers as compared with the skull. In the occasional bifurcation of the expanded end of the brow-antler it again approximates the characters of the Reindeer (*Rangifer*), but does not push its affinity to this genus so far as to have antlers developed in both sexes, as Cuvier suspected. Col. Hamilton Smith, the founder of the subgeneric divisions of the Linnæan *Cervus*, has referred the gigantic Deer of Ireland to the section *Dama*, or the Fallow Deer*; but the peculiar proportions and modifications of the antlers of the extinct species in question afford as good grounds for a special subgenus for its reception, as those on which the subgenus *Dama* itself has been proposed.

The forms and proportions of the cranium, and especially of the bones, and especially those of the nose and of the upper and lower jaws, closely agree with the type of the Fallow and Reindeer.

From a freshwater Pleistocene deposit of shell marl beneath a bog near the town of Limerick. *Purchased.*

1121. The skull and antlers of the gigantic Deer (*Megaceros Hibernicus*). The antlers measure across in a straight line, between the extreme tips, eight feet four inches; each antler, from the burr to the extreme tip following the curve of the middle, measures five feet nine inches. The breadth of the expanded extremity of the broadest brow-antler is four inches four lines. The number of snags or branches of the beam is seven, one being continued from the hind margin about one-third of the way from the base. The breadth of the occiput is seven inches.

From the Pleistocene freshwater marl beneath a bog in the county of Limerick. *Purchased.*

1122. The skull and mutilated antlers of the gigantic Deer (*Megaceros Hibernicus*). The brow-antlers in this specimen present a rhomboidal form, slightly concave above, and measures six inches and a half across their

* Griffith's Translation of Cuvier, vol. iv. p. 87, vol. v. p. 306.

broadest part; the circumference of the beam above their origin is ten inches, as in the preceding specimen.

Locality unrecorded.

Hunterian.

1123. The skull and mutilated antlers of the Gigantic Deer (*Megaceros Hibernicus*). The right brow-antler is bifurcate, the breadth between the tips of the forks being six inches; the circumference at the beam above its origin is nine inches.

Locality unrecorded.

Hunterian.

1124. A vertical longitudinal section of the skull of the Gigantic Deer (*Megaceros Hibernicus*), with the beam of the right antler.

From the Pleistocene freshwater marl, beneath a bog in the county Down, Ireland.

Purchased.

1125. A longitudinal section of the beam of an antler, with the part of the calvarium from which it grew, of the Gigantic Deer (*Megaceros Hibernicus*), showing the compact cellular tissue of the pedestal or stem of the antler between the skull and the burr, and the looser cancellous tissue and cavity in the centre of the beam.

From the Pleistocene freshwater marl, beneath a bog in the county Down, Ireland.

The specimen from which the section was made was

Presented by the Earl of Enniskillen.

1126. The base of a shed antler of the Gigantic Deer (*Megaceros Hibernicus*), showing the convex surface which has been detached by the absorbent process from the skull.

From the Pleistocene marl, beneath a bog in the county of Longford, Ireland.

Presented by the Earl of Enniskillen.

1127. The skull of a female of the Gigantic Deer (*Megaceros Hibernicus*). It shows that this sex, as in most other species of *Cervus*, had no antlers: a longitudinal angular prominence rises from the posterior half of the frontal suture, like that in the Giraffe; there is an irregular subquadrangular vacuity separating the contiguous extremities of the frontal, nasal,

lacrimal and superior maxillary bones; the roof of each orbit is perforated by a circular foramen half an inch in diameter; the occipital bone, and especially the condyles, are of less relative extent than in the male. This rare specimen was taken from the Pleistocene freshwater marl, beneath a bog in the county of Longford, Ireland. *Purchased.*

1128. The lower jaw of the Gigantic Deer (*Megaceros Hibernicus*), wanting the incisor teeth.
 From the Pleistocene freshwater marl, beneath a bog in the county of Longford, Ireland. *Presented by the Earl of Enniskillen.*
1129. The left ramus of the lower jaw of the Gigantic Deer (*Megaceros Hibernicus*), showing the effects of inflammation and ulceration on the outer and under surfaces of the bone.
 From the Pleistocene freshwater marl, beneath a bog in the county of Longford, Ireland. *Presented by the Earl of Enniskillen.*
1130. The right ramus of the lower jaw of the Gigantic Deer (*Megaceros Hibernicus*); with the outer wall of the sockets of the molar teeth removed to expose their fangs. *Hunterian.*
1131. The left ramus of the lower jaw of the Gigantic Deer (*Megaceros Hibernicus*); with the course of the dental canal exposed. *Hunterian.*
1132. The atlas of the male *Megaceros Hibernicus*: both transverse processes have been broken off.
 From the Pleistocene marl, beneath a bog in the county of Longford, Ireland. *Presented by the Earl of Enniskillen.*
1133. The body of the dentata of the same *Megaceros Hibernicus*.
Presented by the Earl of Enniskillen.
1134. An entire atlas of the male *Megaceros Hibernicus*.
 Locality unrecorded. *Hunterian.*
1135. The vertebra dentata of the *Megaceros Hibernicus*.
 Locality unrecorded. *Hunterian.*
1136. The third cervical vertebra of the male *Megaceros Hibernicus*.
 Locality unrecorded. *Hunterian.*

1137. The fourth cervical vertebra of the male *Megaceros Hibernicus*.
 Locality unrecorded. *Hunterian.*
1138. The fifth cervical vertebra of the male *Megaceros Hibernicus*.
 Locality unrecorded. *Hunterian.*
1139. The sixth cervical vertebra of the male *Megaceros Hibernicus*.
 Locality unrecorded. *Hunterian.*
1140. The seventh cervical vertebra of the male *Megaceros Hibernicus*.
 Locality unrecorded. *Hunterian.*
1141. The first dorsal vertebra of the male *Megaceros Hibernicus*.
 Locality unrecorded. *Hunterian.*
1142. The second dorsal vertebra of the male *Megaceros Hibernicus*.
 Locality unrecorded. *Hunterian.*
1143. The third dorsal vertebra of the male *Megaceros Hibernicus*.
 Locality unrecorded. *Hunterian.*
- These dorsal vertebræ are remarkable in the male for the great height of the spinous process, and the cervical vertebræ in the same sex are equally remarkable for their size and strength, both of which relate to the support of the enormous weight of the head when the antlers are fully developed.
1144. A middle dorsal vertebra of the *Megaceros Hibernicus*. *Hunterian.*
1145. A middle dorsal vertebra of the *Megaceros Hibernicus*, in longitudinal section. *Hunterian.*
1146. A posterior dorsal vertebra of the *Megaceros Hibernicus*.
 Locality unrecorded. *Hunterian.*
1147. A lumbar vertebra of the *Megaceros Hibernicus*.
 Locality unrecorded. *Hunterian.*
1148. A lumbar vertebra of the *Megaceros Hibernicus*. *Hunterian.*
1149. A lumbar vertebra of the *Megaceros Hibernicus*, in longitudinal section. *Hunterian.*
1150. The last lumbar vertebra of the *Megaceros Hibernicus*. *Hunterian.*

1151. A sacrum of the *Megaceros Hibernicus*.
 Locality unrecorded. *Hunterian.*
1152. A right scapula of the *Megaceros Hibernicus*.
 Locality unrecorded. *Hunterian.*
1153. A left scapula of the *Megaceros Hibernicus*. *Hunterian.*
1154. A longitudinal section of the scapula of the *Megaceros Hibernicus*.
Hunterian.
1155. A left humerus of the *Megaceros Hibernicus*.
 Locality unrecorded. *Hunterian.*
1156. A left humerus of the *Megaceros Hibernicus*, longitudinally bisected.
Hunterian.
1157. A radius, with the anchylosed rudiment of the ulna, of a *Megaceros Hibernicus*.
 Locality unrecorded. *Hunterian.*
1158. The radius of the *Megaceros Hibernicus*, longitudinally bisected.
Hunterian.
1159. The olecranon, which is the chief part of the ulna developed, of the *Megaceros Hibernicus*. *Hunterian.*
1160. The left cuneiform bone of the *Megaceros Hibernicus*, one surface of which seems to have been in a state of ulceration.
 From the gravel beneath a bog in Ireland.
Presented by the Earl of Enniskillen.
1161. The metacarpus or fore cannon-bone of the *Megaceros Hibernicus*.
Hunterian.
1162. The metacarpal bone of the *Megaceros Hibernicus*, longitudinally bisected.
Hunterian.
1163. The femur of the *Megaceros Hibernicus*. *Hunterian.*
1164. The femur of the *Megaceros Hibernicus*, longitudinally bisected.
Hunterian.

1165. The tibia of the *Megaceros Hibernicus*. *Hunterian.*
1166. The tibia of the *Megaceros Hibernicus*, longitudinally bisected. *Hunterian.*
1167. The distal extremity of the left tibia of the *Megaceros Hibernicus*: a transverse section has been removed from part of the wall of the bone to show its extremely dense and compact texture; the distal articular surface is beautifully entire. *Hunterian.*
1168. The astragalus of the *Megaceros Hibernicus*. *Hunterian.*
1169. The calcaneum of the *Megaceros Hibernicus*. *Hunterian.*
1170. The calcaneum of the *Megaceros Hibernicus*, longitudinally bisected. *Hunterian.*
1171. The anchylosed cuboid and scaphoid bones of the *Megaceros Hibernicus*. *Hunterian.*
1172. The metatarsus or hind cannon-bone of the *Megaceros Hibernicus*. *Hunterian.*
1173. The metatarsus of the *Megaceros Hibernicus*, longitudinally bisected. *Hunterian.*
1174. A proximal phalanx of the *Megaceros Hibernicus*. *Hunterian.*
1175. A middle phalanx of the *Megaceros Hibernicus*. *Hunterian.*
1176. A distal or unguis phalanx of the *Megaceros Hibernicus*. *Hunterian.*

Subgenus *Elaphus* (Round-antlered Deer).

1177. A fragment of the skull, with the base of the antler, of a Deer, nearly allied to, if not identical with, the Red Deer (*Cervus Elaphus*, Linn.).
From the brick earth of the drift or diluvium of Essex. *Hunterian.*
1178. Three fragments of an antler of a large Deer, nearly allied to, if not

identical with, the *Cervus Elaphus*. They appear to have been obtained from the subjacent gravel of some bog, and are encrusted with fragments of stone and brick cemented together by black mud.

Locality unrecorded.

Hunterian.

1179. The base of the antler of the Red Deer (*Cervus Elaphus*). It has been shed, and the separated surface shows the usual convexity below the burr.

From the ancient landslip of Bonchurch.

Presented by Dr. Richardson.

1180. One of the snags or branches of an antler of apparently the Red Deer.

From Loughborough, Leicestershire.

Hunterian.

1181. A portion of the scapula of the same Deer, most probably the *Cervus Elaphus*.

Both these specimens were obtained at Loughborough, Leicestershire, in the year 1786; their condition is indicated by a memorandum attached to them in the original Hunterian Catalogue, where they are called "two bones calcined;" they have lost most of their animal matter and adhere to the tongue.

Hunterian.

1182. The base of the antler, with the brow-antler, of a Deer, allied to, if not identical with, the *Cervus Elaphus*: it is in the same condition as the fossils from Loughborough, Nos. 1180 and 1181.

Locality unrecorded.

Hunterian.

1183. A fragment of the antler of the *Cervus Elaphus*(?): it is in the same condition as the foregoing fossils.

Locality unrecorded.

Hunterian.

1184. A fragment of the antler of the *Cervus Elaphus* (?): it is in the same condition as the preceding fossils.

Locality unrecorded.

Hunterian.

1185. The shaft of the right femur of a large species of Deer, allied to, if not identical with, the *Cervus Elaphus*. A fossil like the present, wanting

the characteristic articular extremities, may be recognised as Mammalian by its medullary cavity and by the texture of the walls, and as belonging to the section of the true Ruminants by the position of the orifice of the medullary artery on the fore part of the proximal end of the shaft and by the direction of the canal obliquely downwards and inwards.

Locality unrecorded. *Hunterian.*

1186. The right metatarsal bone of a Red Deer, *Cervus Elaphus*.

Locality unrecorded. *Hunterian.*

1187. The left metatarsal bone of apparently the same Deer.

In both bones the borders of the posterior tendinal groove are unusually developed. *Hunterian.*

The following fossil remains, No. 1188 to No. 1203 inclusive, apparently identical with the Red Deer, were discovered by Joseph Whidbey, Esq., in one of the cavernous fissures of the limestone quarries at Orcston, and are noticed by Mr. Clift in his memoir on the bones there discovered, in the Philosophical Transactions, 1823, p. 86.

1188. A portion of the right ramus of the lower jaw, with the last two molars, of the *Cervus Elaphus*. *Presented by Joseph Whidbey, Esq., F.R.S.*

1189. The proximal end of the rib of a Deer.

Presented by Joseph Whidbey, Esq., F.R.S.

1190. The proximal end of a smaller or posterior rib of a Deer.

Presented by Joseph Whidbey, Esq., F.R.S.

1191. The distal half of the right humerus of a Deer.

Presented by Joseph Whidbey, Esq., F.R.S.

1192. The proximal extremity or olecranon of the left ulna of a Deer.

Presented by Joseph Whidbey, Esq., F.R.S.

1193. The proximal half of the right radius, with part of the anchylosed shaft, of the ulna of a Deer. *Presented by Joseph Whidbey, Esq., F.R.S.*

1194. The left metacarpal bone, wanting the distal extremity, of a Deer.

Presented by Joseph Whidbey, Esq., F.R.S.

1195. A proximal phalanx of the left fore-foot of a Deer.

Presented by Joseph Whidbey, Esq., F.R.S.

1196. A proximal phalanx of a right fore-foot of a Deer.

Presented by Joseph Whidbey, Esq., F.R.S.

1197. The right iliac bone of a Deer.

Presented by Joseph Whidbey, Esq., F.R.S.

1198. The proximal end of the right tibia of a Deer.

Presented by Joseph Whidbey, Esq., F.R.S.

1199. The proximal half of the right tibia of a Deer.

Presented by Joseph Whidbey, Esq., F.R.S.

1200. The distal half of the right tibia of a Deer.

Presented by Joseph Whidbey, Esq., F.R.S.

1201. The left patella of a Deer.

Presented by Joseph Whidbey, Esq., F.R.S.

1202. The left os calcis of a Deer.

Presented by Joseph Whidbey, Esq., F.R.S.

1203. A right os calcis of a Deer.

Presented by Joseph Whidbey, Esq., F.R.S.

The following fossils, from No. 1204 to 1214 inclusive, of a Deer, nearly allied to, if not identical with, the Red Deer (*Cervus Elaphus*), are from the cave at Kirkdale.

1204. An anterior molar tooth and a portion of the rib of a Deer, imbedded in the mud or clay beneath the stalagmite on the floor of the cave at Kirkdale.

Presented by John Gibson, Esq., F.G.S.

1205. The base of the antler, with a considerable proportion of the brow-antler, of a large Deer, nearly allied to, if not identical with, the *Cervus Elaphus*.

From the cave at Kirkdale.

Presented by John Gibson, Esq., F.G.S.

1206. The distal end of the left radius of a Deer, of the size of the *Cervus Elaphus*.
Presented by John Gibson, Esq., F.G.S.
1207. The anterior part of the sacrum of a Deer, of the size of the *Cervus Elaphus*.
Presented by John Gibson, Esq., F.G.S.
1208. Fragments of an iliac bone of a Deer, of the size of the *Cervus Elaphus*.
Presented by John Gibson, Esq., F.G.S.
1209. The head of the femur of a Deer.
Presented by John Gibson, Esq., F.G.S.
1210. The proximal end and part of the shaft of the right tibia of a Deer.
Presented by John Gibson, Esq., F.G.S.
1211. The distal end of the right tibia of a Deer.
Presented by John Gibson, Esq., F.G.S.
1212. The distal end of the left tibia of a Deer.
Presented by John Gibson, Esq., F.G.S.
1213. The proximal end of the right metatarsus, coated with stalactite, of a Deer.
Presented by John Gibson, Esq., F.G.S.
1214. The distal end of the right metatarsus of apparently the same Deer.
Presented by John Gibson, Esq., F.G.S.

The following bones, from No. 1215 to 1226 inclusive, of the Red Deer (*Cervus Elaphus*) were found associated with the remains of the Gigantic Deer (*Megaceros Hibernicus*), in the Pleistocene freshwater deposit beneath a bog in Ireland.

1215. The fourth cervical vertebra of the Red Deer, fractured after death.
Hunterian.
1216. The first dorsal vertebra of the Red Deer.
Hunterian.
1217. The third dorsal vertebra of the Red Deer.
Hunterian.
1218. The fourth dorsal vertebra of the Red Deer.
Hunterian.
1219. The fifth dorsal vertebra of the Red Deer.
Hunterian.

1220. The first rib of the left side of the Red Deer. *Hunterian.*
1221. A lumbar vertebra of the Red Deer. *Hunterian.*
1222. A left astragalus of the Red Deer. *Hunterian.*
1223. A left calcaneum of the Red Deer. *Hunterian.*
1224. The anchylosed cuboid and scaphoid bones of the left tarsus of the Red Deer. *Hunterian.*
1225. A proximal phalanx of the Red Deer. *Hunterian.*
1226. A middle phalanx of the Red Deer. *Hunterian.*
1227. A left metatarsal bone of the Red Deer (*Cervus Elaphus*).
From beneath a turf-bog in the county of Tipperary.
Presented by the Earl of Enniskillen.
1228. An astragalus of the Red Deer (*Cervus Elaphus*).
From beneath four feet of fen or peat moss, in Cambridgeshire.
Presented by W. O. Aikin, Esq.
1229. A metatarsal bone of the Red Deer (*Cervus Elaphus*).
From beneath four feet of fen or peat moss, in Cambridgeshire.
Presented by W. O. Aikin, Esq.
1230. One of the snags or branches of the antler of a Deer (*Cervus*).
From Canstadt in Wirtemberg. *Hunterian.*
1231. An inferior molar of a species of Deer (*Cervus*).
From Bauman's Cavern, in the Hartz Forest, Germany.
Hunterian.
1232. A portion of the calvarium, with the pedestal or base of the antler, of a large species of Deer, nearly allied to, if not identical with, the *Cervus Elaphus*.
From a cave near Palermo, Sicily.
Presented by J. Robertson, Esq.
1233. A portion of the calvarium, with the pedestal or base of the antler, of the same species of Deer.
From the same locality. *Presented by J. Robertson, Esq.*

1234. Portions of the antler of the same species of Deer.

From the same locality.

Presented by J. Robertson, Esq.

The foregoing specimens from Sicily were accompanied by the following memorandum:—

“The large Stag-horns marked with red tape were taken from the cave or grotto; the rest from the other spot, which it may be well to mention was only a few paces in front (but on a lower level by twelve or fifteen feet) of a natural cave or grotto.” The ‘rest’ alluded to are the fossil remains of the Hippopotamus, Nos. 1047 to 1059.

1235. The back part of the cranium of a large species of *Cervus*.

From the tertiary deposits of the Sub-Himalayan range, India.

Presented by the Rev. E. Everest, M.A.

1236. The pedestal and base of the antler of a large species of *Cervus*, of the round-antlered or Elaphine family.

From the tertiary deposits of the Sub-Himalayan range, India.

Presented by the Rev. E. Everest, M.A.

Subgenus *Tarandus* (Rein Deer).

1237. The base of the antler, with a long subcompressed brow-antler broken at the extremity, of the *Tarandus priscus*, ‘Renne d’Etampes,’ Cuv.

This is the original specimen figured in Parkinson’s ‘Organic Remains,’ vol. iii. pl. xx. fig. 3 (half nat. size), and thus noticed at p. 319:—“M. Guettard discovered, between the blocks of sandstone, and in the surrounding sand in the neighbourhood of Etampes, with other bones of different sizes, the bones of an animal which appears to have been of a size between that of the Stag and of the Roebuck; the horns are distinguishable by their being very small, thin and rather flat; and by their giving off, at a little distance from their base, one or two antlers on their fore part. From a variation in this last circumstance, depending very probably on a difference in the age of the animal, these horns may be divided into two sorts. In the one about two inches above the coronet, an iso-

lated antler is given off forwards ; and then the beam itself, which is but little longer than the antler, turns backwards, to be again divided, or at least to give off a second antler on its posterior part. A specimen of this sort, from Etampes, which I purchased from the collection of Mr. Strange, and which bears the description of ‘*A fossil horn of an animal unknown to Dr. Hunter,*’ is represented in pl. xx. fig. 3, the dotted lines in continuation showing the manner in which the second antler was given off.” *Mus. Parkinson.*

Subgenus *Dama* (Fallow Deer).

The two following specimens, though included in the Hunterian series of fossils, are not of the nature of fossilized organic remains.

1238. The right and left metacarpal bones of the Fallow Deer (*Cervus Dama*).
 “Dug up in a nobleman’s park.” *Hunterian.*
1239. The right and left metatarsal bones of the Fallow Deer (*Cervus Dama*).
 “Dug up in a nobleman’s park.” *Hunterian.*
1240. The base of the antler, with the brow-antler, of a small species of *Cervus*.
 Locality unrecorded. *Hunterian.*

Subgenus *Capreolus* (Roe).

1241. The antlers and adherent portions of the skull of a Roebuck (*Cervus Capreolus*, Linn.).
 From the peat-field at Newbury, Berkshire.
Presented by Gerard Smith, Esq.
1242. The antlers of a young Roebuck.
 From the peat-field at Newbury, Berkshire.
Presented by Gerard Smith, Esq.

It is most probable that antlers of the Roe are referred to under the name of “Antelope” in the summary of the organic remains discovered in the peat-bog at Newbury by Dr. Collet in his description of that formation in the ‘*Philosophical Transactions*’ for the year 1757, p. 109.

1243. The left metacarpal bone of the Roebuck (*Cervus Capreolus*, Linn.).
 Locality unrecorded, but the colour and general condition of the bone indicates it to have been derived from a bog. *Hunterian.*
1244. Portions of an antler of a Roebuck.
 From a cave in Glamorganshire.
Presented by Charles Stokes, Esq., F.R.S.

Genus *Palæomeryx**.

1245. The antepenultimate grinder of the right side of the lower jaw of the *Palæomeryx medius*, Herm. v. Meyer.
 The remains of this extinct Ruminant, which was smaller than the Gazelle, have been discovered in the freshwater tertiary formations of Weisenau.
Presented by M. Hermann von Meyer.
1246. The right astragalus of the *Palæomeryx medius*.
 From the freshwater tertiary deposits of Weisenau.
Presented by M. Hermann von Meyer.

Genus *Microtherium*†.

1247. The penultimate molar of the right side of the upper jaw of the *Microtherium Renggeri*, Herm. v. Meyer.
 From the freshwater tertiary deposits of Weisenau.
Presented by M. Hermann von Meyer.
1248. The penultimate molar of the left side of the lower jaw of the *Microtherium Renggeri*, Herm. v. Meyer.
 From the freshwater tertiary deposits of Weisenau.
Presented by M. Hermann von Meyer.

* παλαιὸς ancient, μῆρύκω *I ruminant.*

† μικρὸς small, θηρίον beast.

1249. The last molar of the left side of the lower jaw of the *Microtherium Renggeri*.

From the freshwater tertiary deposits of Weisenau.

Presented by M. Hermann von Meyer.

1250. The left astragalus of the *Microtherium Renggeri*.

From the freshwater tertiary deposits of Weisenau.

Presented by M. Hermann von Meyer.

The remains of the above singular extinct European Cervine animal, which did not exceed the Javan Pigmy Musk-deer in size, offer a remarkable contrast to those of the extinct gigantic Antelope of India, which next follow.

Genus *Sivatherium*.

1251. The last molar tooth, right side, lower jaw, of the *Sivatherium giganteum*, Falconer and Cautley. *Presented by the Rev. R. Everest, M.A.*

1252. A mutilated cervical vertebra of the *Sivatherium giganteum*, wanting the articular processes of the right side and the spine, but with the anterior convex and posterior concave articular extremities of the body beautifully entire.

From the tertiary deposits of the Sewalik or Sub-Himalayan Hills.

Presented by Walter Ewer, Esq., F.R.S.

1253. The right astragalus of the *Sivatherium giganteum*. The outer division of the tibial trochlea is broader than in the astragalus of the Deer, but the bone closely conforms to the Ruminant type.

From the tertiary deposits of the Sewalik Hills.

Presented by Walter Ewer, Esq., F.R.S.

The gigantic extinct Ruminant, to which its discoverers, Dr. Falconer and Captain Cautley, have assigned the name *Sivatherium*, had four horns, two anterior, short, conical and straight, rising from the interorbital space, and two very large, broad, compressed, continued from the posterior

angles of the skull and sending off a short branch. The bony cores are hollow and were persistent, the neck short and strong, as demonstrated by the vertebra, No. 1252, and the animal is evidently to be referred to the Antelope family; in which alone a Ruminant with four horns is still exemplified in the existing Indian species, called *Antilope quadricornis*.

Family *Bovidæ*.

Subgenus *Urus*, Aurochs.

1254. The calvarium and bony cores of the horns of the great extinct Aurochs, *Urus priscus*, Owen. This fine specimen was dug out of a stratum of dark-coloured clay, below layers of brick-earth and gravel, thirty feet from the surface, at Woolwich; it presents the broad convex forehead, the advanced position of the horns, which rise three inches anterior to the upper occipital ridge, and the obtuse-angled junction of the occipital with the coronal or frontal surface of the skull, all which characters distinguish that part of the skeleton of the Aurochs. The bony cores of the horns extend outwards, with a slight curvature upwards: from the mid-line between their bases to the extremity of one core, in a straight line, measures two feet five inches. *Hunterian*.

1255. Fragments of the cranium and the bony cores of both horns of the extinct Aurochs (*Urus priscus*), with the same essential characters as the preceding in regard to the position of the horn-cores; they are relatively thicker, shorter and more curved in this specimen. From the mid-line between their bases to the extremity of one core, in a straight line, measures two feet two inches.

From the brick-earth (Pleistocene) at Ilford, Essex.

Presented by William Thompson, Esq.

1256. Fragments of a cranium, with great part of both horn-cores, of the extinct Aurochs (*Urus priscus*). It resembles, but is rather smaller than the preceding.

From the brick-earth at Ilford, Essex.

Presented by Wm. Thompson, Esq.

1257. The extremity of the core of the horn of an Aurochs (*Urus priscus*).

“From Stonesfield, Oxfordshire.” No doubt from the superficial gravel or drift. *Hunterian*.

1258. A fragment of the cranium, with the bony core of the left horn, of a young or female *Urus priscus*.

From the drift or freshwater pleistocene constituting the brick-earth : locality unrecorded. *Hunterian*.

The following specimens, from No. 1259 to 1327 inclusive, principally if not altogether belonging to a species of *Urus*, are from the cavernous fissures at Oreston, Plymouth, and were presented by Joseph Whidbey, Esq., F.R.S., Civil Engineer.

1259. A portion of the calvarium, with the base of the core of the left horn, of a young Aurochs (*Urus priscus*). The advanced position of the horn, which gives the subgeneric character, is fortunately well demonstrated in this specimen.

1260. The left horn-core of a younger individual of the *Urus priscus*.

1261. A fragment of the right ramus of the lower jaw, with three anterior molar teeth, of the *Urus priscus*.

1262. Anterior part of right ramus of the lower jaw, with the first and second molar teeth, of the *Urus priscus*.

1263. A portion of the posterior part of the right ramus of the lower jaw of the *Urus priscus*.

1264. A fractured vertebra dentata of the *Urus priscus*.

1265. A fractured vertebra dentata of the *Urus priscus*.

1266. The third cervical vertebra of the *Urus priscus*.

1267. The sixth cervical vertebra of a young *Urus priscus*.

1268. The fourth dorsal vertebra of a young *Urus priscus* : the epiphysial articular surfaces have been detached from the body.

1269. An eighth dorsal vertebra of the *Urus priscus*.

1270. The last dorsal vertebra of a young *Urus priscus*.
1271. The last dorsal vertebra of a young *Urus priscus*.
1272. The third lumbar vertebra of the *Urus priscus*.
1273. A portion of the sacrum, including one of the anterior articulating processes, of the *Urus priscus*.
1274. Anterior part of the sacrum of the *Urus priscus*.
1275. The spine of the sacrum of the *Urus priscus*.
1276. A caudal vertebra of the *Urus priscus*.
1277. The last bone of the sternum of the *Urus priscus*.
1278. The second bone of the sternum of the *Urus priscus*.
1279. The right humerus of the *Urus priscus*.
1280. The right radius, with the anchylosed distal half of the ulna, of the *Urus priscus*.
1281. The right olecranon of the *Urus priscus*.
1282. The left olecranon of the *Urus priscus*.
1283. The right scaphoid of a young Aurochs (*Urus priscus*).
1284. The left os lunare of a young Aurochs (*Urus priscus*).
1285. The left os cuneiforme of a young Aurochs (*Urus priscus*).
1286. The left trapezoides of a young Aurochs (*Urus priscus*).
1287. The right trapezoides of a smaller Aurochs (*Urus priscus*).
1288. The right metacarpal bone of a young Aurochs (*Urus priscus*).
1289. The right metacarpal bone of a still younger Aurochs.
1290. The shaft of the left metacarpal bone of a young Aurochs, wanting the distal epiphysis.
1291. The left metacarpal bone of a younger Aurochs.
1292. The distal end of a metacarpal bone of a very young or calf Aurochs.

1293. The proximal phalanx of the inner toe of the right fore-foot of a young Aurochs.
1294. The middle phalanx of the inner toe of the right fore-foot of a young Aurochs.
1295. The distal phalanx of the inner toe of the right fore-foot of a young Aurochs.
1296. The proximal phalanx of the outer toe of the right fore-foot of a young Aurochs.
1297. The middle phalanx of the outer toe of the right fore-foot of a young Aurochs.
1298. The distal phalanx of the outer toe of the right fore-foot of a young Aurochs.
1299. A large portion of the right os innominatum, including the acetabulum, of the *Urus priscus*.
1300. A fragment of the right os innominatum of the *Urus priscus*.
1301. A small portion of the left os innominatum of the *Urus priscus*.
1302. The head of the right femur, in the condition of a detached epiphysis, of a young Aurochs (*Urus priscus*).
1303. The right femur, wanting the proximal end, of a young Aurochs.
1304. The right femur, wanting the distal extremity, of a young Aurochs.
1305. The head of the left femur, in the condition of a detached epiphysis, of a young Aurochs.
1306. The left patella of a young Aurochs.
1307. The right tibia of a young Aurochs: the proximal epiphysis has been detached from the shaft; the distal epiphysis has become anchylosed, but the line of union may still be traced.
1308. The left tibia of an Aurochs, of the same size as the preceding, but with both epiphyses anchylosed to the shaft.
1309. The right astragalus of an Aurochs.

1310. The left astragalus of an Aurochs.
1311. The right os calcis of an Aurochs.
1312. The left os calcis of an Aurochs.
1313. The left scapho-cuboid bone of a young Aurochs.
1314. The left internal cuneiform bone of a young Aurochs.
1315. The proximal two-thirds of the right metatarsal bone of an Aurochs (*Urus priscus*): it presents an unusual prominence of the inner border of the anterior groove for the extensor tendon which traversed the middle of that surface of the metatarsus, bending the groove obliquely outward.
1316. The left metatarsal bone of an Aurochs (*Urus priscus*); showing the same character of the enlarged and produced inner border of the anterior tendinal groove. This character might be regarded, if present in a single example, as the effect of partial ossific inflammation, but I have observed it in the metatarsal bone of an Aurochs from the freshwater pleistocene deposits at Clacton, Essex, and in another larger metatarsal from the drift gravel at Kensington.

The following seven bones form part of the left hind-foot of the same individual Aurochs.

1317. The metatarsal or cannon-bone.
1318. The proximal phalanx of the inner toe.
1319. The proximal phalanx of the outer toe.
1320. The middle phalanx of the inner toe.
1321. The middle phalanx of the outer toe.
1322. The ungual phalanx of the inner toe.
1323. The ungual phalanx of the outer toe.
1324. The proximal phalanx of the outer toe of the hind-foot of a young Aurochs (*Urus priscus*).
1325. A mass of breccia, with a fragment of the shaft of the tibia of a small or young Aurochs.

1326. A mass of breccia, including fragments of long bones and one of the proximal phalanges of a young Aurochs.
1327. The proximal half of the right metacarpal bone of an Aurochs (*Urus priscus*). It shows the effects of long-continued ossific inflammation and ulceration on its anterior surface. The original is described and figured by Mr. Clift in his "Memoir on the Fossil Bones from the Oreston Caverns" in the Philosophical Transactions for 1823, p. 84, pl. 8. fig. 1.

The following bones, Nos. 1328 to 1344 inclusive, of a Bovine animal, from which the subgeneric characters cannot be determined, are from the cave at Kirkdale, Yorkshire, and were presented by John Gibson, Esq., F.G.S.

1328. The left metacarpal bone of a species of *Bos* or *Urus*.
1329. The inner half of the right metacarpal bone of the same species of *Bos* or *Urus*.
1330. The proximal end of the right metacarpal bone of the same species of *Bos* or *Urus*.
1331. A portion of the distal articular surface of a metacarpal bone of a species of *Bos* or *Urus*.
1332. The right astragalus of a species of *Bos* or *Urus*.
1333. The right astragalus of the same species of *Bos* or *Urus*.
1334. A portion of the right os calcis of a species of *Bos* or *Urus*; fractured and apparently gnawed at the back part.
1335. A fragment of the right os calcis of the same species of *Bos* or *Urus*.
1336. The left calcaneum of the same species of *Bos* or *Urus*.
1337. The left scapho-cuboid bone of a large *Bos* or *Urus*.
1338. The left scapho-cuboid bone of a larger individual Ox or Aurochs.
1339. A proximal phalanx of a species of *Bos* or *Urus*.
1340. A fractured proximal phalanx of the same species of *Bos* or *Urus*.
1341. The right astragalus, fractured, and with adherent stalactite, of a species of *Bos* or *Urus*.

1342. A mass of stalactite, including fragments of bone and the last lower molar tooth of an Ox or Aurochs.
1343. Portions of ribs of an Ox or Aurochs, cemented together and coated with stalactite.
1344. The first phalanx of the fore-foot of an Ox or Aurochs, coated with stalactite and cemented to other portions of bone.
1345. The crown of a lower molar of a large Bovine animal (*Bos* or *Urus*): the unworn summits of the crescentic lobes prove it to have belonged to an immature individual.

From the cave of Kent's Hole, Torquay, Devon.

Presented by Gerard Smith, Esq.

1346. A fragment of a lower jaw of a large Bovine animal, with two molar teeth.
Found associated with remains of the Mammoth in pleistocene deposits or drift, Warwickshire. *Hunterian.*
1347. A fragment of a lower jaw, with two molar teeth, the last and penultimate, of a large Bovine animal.
Found associated with remains of the Mammoth in pleistocene deposits or drift, Warwickshire. *Hunterian.*
1348. A second molar, right side, lower jaw, of a Bovine animal
Found associated with remains of the Mammoth in pleistocene freshwater deposits or drift, Warwickshire. *Hunterian.*
1349. The penultimate molar, left side, lower jaw, of a species of *Bos* or *Urus*.
Hunterian.
1350. The last molar, left side, lower jaw, of the same Ox or Aurochs.
Hunterian.

Both these specimens are from red brick earth; they were found associated with No. 1032, the tip of the incisive tusk of a Hippopotamus.

The following remains, No. 1351 to 1393 inclusive, of an Aurochs, belonging to the same individual animal, were discovered in pleistocene freshwater deposits at Bricklehampton Bank, near Cropthorn, Gloucestershire, and were presented to the College by Hugh Strickland, Esq., F.G.S.

351. The bone-core of the left horn of the *Urus priscus*.
1352. The par-occipital processes of the skull of the *Urus priscus*.
1353. The condyloid and coronoid processes of the left ramus of the lower jaw of the *Urus priscus*.
1354. The anterior edentulous portion of the right ramus of the same lower jaw.
1355. The first molar tooth of the right side of the same lower jaw.
1356. The second molar of the right side of the same lower jaw.
1357. The first molar of the left side of the same lower jaw.
1358. A portion of the left ramus of the same lower jaw, containing the third and fourth molar teeth.
1359. The fifth or antepenultimate molar of the same lower jaw.
1360. A portion of the same lower jaw, containing the last molar teeth.
1361. The last molar tooth of the right side of the same lower jaw.
1362. The third cervical vertebra of the *Urus priscus*.
1363. The fourth cervical vertebra of the *Urus priscus*.
1364. The fifth cervical vertebra of the *Urus priscus*.
1365. The sixth cervical vertebra of the *Urus priscus*.
1366. The seventh cervical vertebra of the *Urus priscus*.
1367. The spine of an anterior dorsal vertebra of the *Urus priscus*.
1368. The body and neural arch of an anterior dorsal vertebra of the *Urus priscus*, showing abnormal osseous growths from the circumference of the articular extremities.
1369. The body of a middle dorsal vertebra of the *Urus priscus*.
1370. The anterior lumbar vertebra, wanting the spinous and transverse processes, of the *Urus priscus*.
1371. The fourth lumbar vertebra of the *Urus priscus*.
1372. The fifth lumbar vertebra of the *Urus priscus*.

1373. The sixth lumbar vertebra, wanting the spinous and transverse processes, of the *Urus priscus*.
1374. The last lumbar vertebra, similarly mutilated, of the *Urus priscus*.
1375. The vertebral halves of three ribs of the *Urus priscus*.
1376. A mutilated proximal extremity of the right humerus of the *Urus priscus*.
1377. The mutilated olecranon of the right ulna of the *Urus priscus*.
1378. The right scaphoid or navicular bone of the *Urus priscus*.
1379. The right metacarpal bone of the *Urus priscus*.
1380. The proximal phalanx of the outer toe of the right fore-foot of the *Urus priscus*.
1381. The middle phalanx of the same toe of the *Urus priscus*.
1382. The distal phalanx of the same toe of the *Urus priscus*.
1383. The mutilated distal phalanx of the inner toe of the same fore-foot of the *Urus priscus*.
1384. The right os innominatum of the *Urus priscus*.
1385. The right tibia, wanting the proximal end, of the *Urus priscus*.
1386. The right astragalus of the *Urus priscus*.
1387. The right calcaneum of the *Urus priscus*.
1388. The right scapho-cuboid bone of the *Urus priscus*.
1389. The right metatarsal bone of the *Urus priscus*.
1390. The proximal phalanx of the inner toe of the right hind-foot of the *Urus priscus*.
1391. The middle phalanx of the inner toe of the right hind-foot of the *Urus priscus*.
1392. The distal half of the left tibia of the *Urus priscus*.
1393. The left astragalus of the *Urus priscus*.

The geological formation from which Mr. Strickland obtained the foregoing specimens is noticed by Mr. Murchison in his great work,

'The Silurian System,' p. 555 :—“ Mr. H. E. Strickland is the discoverer of these ancient fluviatile deposits, which extend from Warwickshire into the valley of the Severn, near Tewkesbury. He has found the remains of twenty-four species of fluviatile shells, three of which are considered to be extinct, and the bones of several species of extinct quadrupeds in the gravel of the valley of Avon, an eastern tributary of the Severn (see Geol. Proc. vol. ii. p. 111). Let us now see whether this phenomenon be reconcilable with the view here given, of the comparatively recent period at which the valley of the Severn is supposed to have lain under the sea. The accumulations at and near Crophorn constitute terrace-like hillocks, from one to four miles distant from the present bed of the Avon, above which their summits rise to a height of forty to fifty feet. Mr. Strickland has traced these accumulations, which he first termed “fluviatile diluvium,” at intervals from Lawford in Warwickshire to Defford in Worcestershire, and he has proved that they follow more or less the course of the present Avon from north-east to south-west. I refer to his interesting paper, shortly I hope to be published at length, for the details presented at different localities, it being sufficient for the present purpose to state the general results. I examined in company with him two of the sections to which he refers. The clearest of these is at Bricklehampton Bank, near Crophorn on the Avon, where about twenty feet of this detrital matter is arranged in the following manner, resting upon the lias clay.

“*Upper portion*, stiff reddish clay with a few pebbles; the *central* also argillaceous but more marly, of green and purple colours, with some yellow sand, and occasional irregular laminæ of marl; *lowest*, sand and gravel, confusedly mixed up with lumps of marl, pebbles of quartz (some five to six inches in diameter), broken chalk flints, much detritus of the lias, and very rarely a fragment of oolite.

“Many of the delicate shells mentioned in Mr. Strickland's list, were found from the top to the bottom of this varied and almost coarse drift; being just as abundant in the underlying gravel as in the overlying marl and clay. The bones of the quadrupeds occurred also through the mass, though they were most abundant in the lower part. The discovery of

these fragile shells, perfectly preserved in beds of such coarse and irregularly formed detritus, is of importance, as it proves that much of the gravel to which the term ‘*diluvium*’ has been applied, may have been deposited by rivers.

“It is thus evident that these fluviatile materials were drifted by a river which flowed through dry land on the E.N.E. into the channel or estuary so often mentioned, and it is therefore probable that they were sometimes transported beyond the mouth of the ancient Avon, and deposited in shoals or banks beneath the waters of the channel.

“The bones of extinct quadrupeds, already noticed as occurring on the western or opposite side of the valley of the Severn, at Powick and Bromwick Hill near Worcester, and at Fleet Bank near Sandlin, were probably at once washed into the ancient estuary from the adjoining hills by sudden and local floods, as they are not imbedded in debris similar to that of the Avon. The physical features of the country marked by the narrow ridge of the Malverns impending over the valley, account indeed for the non-existence of former rivers, and consequently of fluviatile shells in this direction.”

1394. The body of the vertebra dentata of a large Aurochs (*Urus*) or Ox (*Bos*).

From a pleistocenc deposit in Essex.

Presented by John Gibson, Esq., F.G.S.

1395. An anterior dorsal vertebra of a large Aurochs (*Urus*) or Ox (*Bos*): the vertical extent of this vertebra is twenty-two inches, the spinous process, which is not quite entire, measuring nineteen inches of that extent.

From a pleistocene deposit in Essex.

Presented by John Gibson, Esq., F.G.S.

1396. The right radius of apparently the same large Aurochs or Ox.

From the same formation and locality.

Presented by John Gibson, Esq., F.G.S.

1397. The right metacarpal bone of apparently the same large Aurochs or Ox.

From the same stratum and locality.

Presented by John Gibson, Esq., F.G.S.

1398. The proximal half of the left tibia of apparently the same great Ox or Aurochs.

From the same stratum and locality.

Presented by John Gibson, Esq., F.G.S.

The following specimens of a species of large Bovine animal, No. 1399 to No. 1403 inclusive, appear to have belonged to one individual; they were discovered in the freshwater pleistocene deposits at Bricklehampton Bank, near Crophorn, and were presented by Hugh E. Strickland, Esq.

1399. The axis.

1400. The third cervical vertebra.

1401. An anterior dorsal vertebra; the spine is broken.

1402. The anterior part of the os sacrum.

1403. The proximal half of the left metacarpal bone.

1404. A dorsal vertebra of an Ox or Aurochs.

From the drift or freshwater deposits.

Hunterian.

1405. The left scapula of apparently the same Ox or Aurochs.

From the drift or diluvium at Rawden.

Hunterian.

1406. The metacarpal bone of the left fore-foot of a young Ox or Aurochs.

Locality unrecorded.

Hunterian.

1407. The proximal phalanx of the fore-foot of an Ox or Aurochs.

Locality unrecorded.

Hunterian.

1408. The left astragalus of an Ox or Aurochs.

From the drift or pleistocene deposits in Lincolnshire.

Hunterian.

1409. The left astragalus of an Ox or Aurochs.

Locality unrecorded.

Mus. Parkinson.

Subgenus *Bos* (Ox).

1410. A portion of the bony core of the right horn of the extinct *Bos primigenius*, Bojanus.

From the pleistocene deposits at Ilford, Essex.

Hunterian.

1411. A portion of the bony core of the left horn of the same *Bos priscus*. The circumference of the core of each horn, when entire, measured at the base twenty-two inches.

These fossils were "dug out of the Till or maiden earth twenty-two feet below the surface at Ilford in Essex, in the year 1786, by Mr. John Gilbert." *Hunterian.*

The cores of the horns in the present large extinct species of true Ox bend at first slightly backward and upward, then downward and forward, and finally inward and upward, describing a graceful double curvature; they are tuberculate at the base, impressed by longitudinal grooves, and irregularly perforated: specimens have been found in British strata in which the length of each horn-core along the outer curve was three feet three inches.

1412. A fragment of the core of the left horn of the *Bos primigenius*.

Locality unrecorded. *Hunterian.*

1413. A fragment of the skull, with the base of the core of the left horn, of a young or female *Bos primigenius*.

It was discovered in drift or diluvium, associated with No. 1035, the canine of a Hippopotamus. *Hunterian.*

1414. A portion of the skull, with the right horn-core, of a young or female *Bos primigenius*.

Locality unrecorded. *Hunterian.*

1415. The right metacarpal bone of the *Bos primigenius*.

Locality unrecorded. *Hunterian.*

1416. The left metacarpal bone of the same *Bos primigenius*.

Locality unrecorded. *Hunterian.*

1417. Fragments of the shaft of the tibia of a large *Bos* or *Urus*.

Locality unrecorded. *Hunterian.*

1418. The last left molar of a *Bos* or *Urus*.

"It was found six feet below the surface of the ground, near Gloucester." *Presented by Sir Everard Home, Bart., F.R.S.*

1419. The skull, mutilated anteriorly, and without the lower jaw, of the *Bos longifrons*, Owen.

This species belongs to the subgenus *Bos*, by the form of the forehead and the origin of the horns from the extremities of the upper occipital ridge, but is distinguished from the *Bos primigenius* by its much smaller size, its much shorter horns in proportion to its size, and by its longer and narrower forehead. The horns have a simple curvature forward, and a little downward.

From the freshwater deposits of shell-marl beneath a bog at Longford, Ireland.
Presented by the Earl of Enniskillen.

1420. The calvarium and horn-cores of the *Bos longifrons*.

“From a bog in Ireland.”

Hunterian.

1421. A plaster-cast of part of the calvarium and horn-cores of the *Bos longifrons*.

The original is from the shell-marl beneath a bog in Westmeath, Ireland, and has been described by Robert Ball, Esq., Secretary to the Zoological Society of Dublin, in the Proceedings of the Royal Irish Academy for January 1839, as indicating “a variety or race differing very remarkably from any previously described in works with which the author was acquainted.”

Presented by Robert Ball, Esq.

1422. The left horn-core of the *Bos longifrons*.

From beneath a peat moss or fen near the town of Hull.

Presented by Arthur Aikin, Esq., F.G.S.

1423. The right humerus of the *Bos longifrons*.

From beneath a bog at Longford, Ireland.

Presented by the Earl of Enniskillen.

1424. The left iliac bone of the *Bos longifrons*.

From beneath a bog at Longford, Ireland.

Presented by the Earl of Enniskillen.

1425. The left metatarsal bone of the *Bos longifrons*.

From beneath a bog at Longford, Ireland.

Presented by the Earl of Enniskillen.

146. The last molar tooth, left side, lower jaw, of a large Bovine animal.
From the tertiary deposits of the Sub-Himalayan range, India.
Presented by the Rev. E. Everest, M.A.
1427. The distal end of the left metacarpal bone of a large Bovine animal.
From the tertiary deposits of the Sub-Himalayan range, India.
Presented by the Rev. E. Everest, M.A.
1428. The right astragalus of a large Bovine animal.
From the tertiary deposits of the Sub-Himalayan range, India.
Presented by the Rev. E. Everest, M.A.

Subgenus *Ovibos* (Musk-Ox).

1429. The posterior part of the cranium of the fossil Musk-Ox (*Ovibos Pallasii*).
From the drift of Siberia. *Mus. Brookes.*
1430. A cast of the posterior part of the cranium of the *Ovibos Pallasii*.
From the drift of Siberia.
Presented by Roderick Impey Murchison, Esq., P.G.S.

Order CETACEA.

Genus *Delphinus*.

1431. A middle dorsal vertebra of a large species of *Delphinus*: the articular epiphysial plates are detached from the centrum; the neural arch is broken away.
From the tertiary strata of Alabama, North America. *Purchased.*
1432. A lumbar or anterior caudal vertebra of a large species of *Delphinus*.
From the tertiary strata of Alabama, North America. *Purchased*
1433. The body of an anterior caudal vertebra of a large *Delphinus*. The epiphysial articular plates are anchylosed to the centrum and the whole vertebra is petrified.
Locality unrecorded, probably from the Crag. *Hunterian.*

1434. The body of an anterior caudal vertebra of a large *Delphinus*. The epiphysial articular plates are anchylosed and the whole is petrified: it has been waterworn and apparently perforated by sea-shells.
Locality unrecorded. *Hunterian.*
1435. The body of an anterior caudal vertebra of a *Delphinus*, wanting the terminal epiphysial plates and partially petrified.
Locality unrecorded. *Hunterian.*
1436. A caudal vertebra of a smaller species of *Delphinus*, with the terminal epiphyses confluent with the body.
Locality unrecorded. *Hunterian.*
1437. A more posterior caudal vertebra of the same species of *Delphinus*.
Locality unrecorded. *Hunterian.*
1438. A posterior caudal vertebra of a *Delphinus*. The epiphysial articular plates have been detached from the body.
Locality unrecorded. *Hunterian.*

Genus *Monodon*.

1439. A portion of the tusk of a male Narwhal (*Monodon monoceros*, Linn.): the exterior surface shows the characteristic spiral indentations; on the inside is the smooth surface of the extended pulp-cavity.
From Baunann's cave. *Hunterian.*

Genus *Hyperoodon*.

1440. A vertical longitudinal section of an anterior caudal vertebra of apparently a great Bottle-nose Whale (*Hyperoodon*). It displays a very uniform coarse cancellous structure throughout: the longitudinal diameter of the vertebra is nine inches, the vertical diameter six inches.
The bone seems to have lost some of its original animal matter and to have been partially impregnated with iron, but is not petrified.
Locality unknown. *Hunterian.*

1441. The opposite half of the same vertebra, transversely bisected.

Hunterian.

Genus *Zeuglodon*.

1442. Sections of a rib of the *Zeuglodon cetoides*, Owen. It presents a compact osseous structure with excentric layers of growth.

From the tertiary deposits of the State of Alabama, North America.

Presented by Dr. Richard Harlan.

1443. An anterior caudal vertebra of the *Zeuglodon cetoides*. It measures eight inches and a half in longitudinal diameter and seven inches in transverse diameter: the base of the neural arch, which is five inches in extent, is situated nearer the anterior than the posterior part of the vertebra.

From the tertiary deposits of the State of Alabama, North America.

Purchased.

1444. A posterior caudal vertebra of the *Zeuglodon cetoides*.

From the tertiary deposits of Alabama, North America.

Purchased.

Genus *Physeter*.

1445. The tooth of a Cachalot (*Physeter macrocephalus*): it has lost most of the original animal matter and is partly decomposed into successive layers.

From the newer pliocene strata in South America.

Presented by Charles Darwin, Esq., F.R.S.

- 1445¹. The tooth of a recent Cachalot, for comparison.

Purchased.

Genus *Balæna*.

1446. The caudal vertebra of a Whale (*Balæna mysticetus*?) with the transverse processes broken away: it measures nine inches in longitudinal diameter, and twelve inches in transverse diameter: the articular epiphyseal plates are anchylosed to the body.

From the gravel in the old bed of the Thames; found thirty feet below the surface in excavations near the Temple Church.

Purchased.

1447. The mutilated body of a petrified vertebra of a coarse osseous texture, apparently Cetacean.

Locality unrecorded.

Hunterian.

1448. A cast of the tympanic portion of the petro-tympanic bone of a Whale (*Balæna affinis*, Owen). The specimen measures five inches in length, and resembles the tympanic bone of the *Balæna antarctica* in the slight elevation of the posterior part of the involuted convexity, and its gradual diminution to the Eustachian end of the cavity: it resembles the tympanic bone of both the *Balæna antarctica* and the *Bal. mysticetus* in the gradual continuation of the concave outer wall from the involuted convexity: this convexity is indented also, as in both the recent species of *Balæna*, by vertical fissures, narrower than the marked indentation which distinguishes that part in the *Bal. mysticetus*: the upper surface of the fossil tympanic bone maintains a more equable breadth from the posterior to the anterior end, the outer angle of which is salient in the fossil, but is rounded off in the recent specimens: the under and outer surfaces of the fossil tympanic bone meet at an acute angle. Having found the above characters sufficiently marked in three specimens of fossil tympanic bones, I have regarded them as indicative of a species distinct from the known existing *Balæna*, but most nearly allied to the *Bal. antarctica**

From the red crag at Felixstow, Suffolk.

Presented by the Rev. Prof. Henslow, F.R.S.

1449. A portion of the right tympanic bone of the *Balæna affinis*, from which almost the whole of the free over-arching plate has been broken away.

From the red crag at Felixstow, Suffolk.

Presented by the Rev. Prof. Henslow, F.R.S.

1450. The tympanic bone of the *Balæna mysticetus*, with part of the over-arching plate sawed off, showing the density of its structure, and affording a means of comparison with the fossils. The difference in the breadth of the anterior end of the bone, between the recent and fossil specimens, is well marked.

* Proceedings of the Geological Society, December, 1843.

1451. A cast of a mutilated right tympanic bone of the *Balæna definita*, Owen. This species is more unequivocally characterized than the preceding, by the distinct definition of the involuted convexity, and by the extent of the slightly concave surface extending from the convexity to the commencement of the overarching wall; the anterior extremity of the involuted convexity is equally well-defined, and a wide concavity divides it from the anterior extremity of the Eustachian outlet. The involuted convexity is but slightly elevated even at its broadest part. The under and outer surfaces of the bone meet at a right angle.

From the red crag at Felixstow, Suffolk.

Presented by the Rev. Prof. Henslow, F.R.S.

1452. A mutilated right tympanic bone of the *Balæna definita*: it equally well manifests the characters of the well-defined convexity, and the wide interspace between that part and the origin of the overarching plate, most of which is broken away: in this example also the under and outer surfaces of the bone meet at right angles to form a ridge along the exterior of the bone.

From the red crag at Felixstow, Suffolk.

Presented by the Rev. Prof. Henslow, F.R.S.

1453. A mutilated right tympanic bone of the *Balæna gibbosa*, Owen. This differs from the tympanum of the *Balæna affinis* in the shorter and more prominent involuted convexity, the anterior end of which is divided from the anterior end of the cavity by a concave border of nearly equal longitudinal extent; the internal border of the involuted convexity is also better defined than in the *Balæna affinis*, but is situated as closely as in that species to the overarching wall, which is divided from it only by a deep and narrow rugged fissure, and not by a broad and gently concave tract as in the *Balæna definita*. Both the outer and under surfaces of this specimen are more rounded than in the two preceding species; but, being more mutilated and waterworn, the characters derivable from the external parts of the bone are of less value. The characters above specified, which are furnished by the involuted convexity, are decisive as to the specific distinction of the present fossil.

From the red crag at Felixstow, Suffolk.

Presented by the Rev. Prof. Henslow, F.R.S.

1454. A cast of a mutilated left tympanic bone of the *Balæna emarginata*, Owen. This fossil differs from the last specimen in the less degree of convexity of the involuted part, but more particularly in its outer border being notched or indented, as in the *Balæna mysticetus*, by a vertical angular impression, deeper and wider than the smaller vertical fissures (see No. 1450). The comparative shortness of the involuted convexity distinguishes this species from the *Balæna affinis*, the vertical notch and the minor convexity of the involution distinguish it from the *Balæna gibbosa*, and the immediate rising of the overarching wall, beyond the inner boundary of the involution, from the *Balæna definita*.

From the red crag at Felixstow, Suffolk.

Presented by the Rev. Prof. Henslow, F.R.S.

All the more perfect ‘cetotolites,’ as the foregoing fossils have been termed, which have shown the form of the tympanic cavity bounded by the overarching thin plate, and at the same time the proportion and direction of the anterior or Eustachian outlet, and above all the larger or posterior end of the bone, have demonstrated their difference from the tympanic bone in the *Grampus*, *Hyperoodon* and other larger *Delphinidæ*, inasmuch as these Cetaceans have the posterior end of the tympanic bone bilobed, and not entire or simple as in the fossils, and they likewise have the anterior outlet of the tympanic cavity partially inclosed by the extension of the outer plate around that end. With regard to the Cachalot (*Physeter*), I have had no opportunity of comparing the Felixstow fossils with the tympanic bone in that genus, except by means of the figures of it, given by Camper* in his usual spirited but sketchy style: Cuvier, who founds his notice of the tympanic bones of the Cachalot on the same figures, states that they most resemble those of the *Delphinidæ*, but are less elongated and less bilobed posteriorly. The figures show still more clearly that the tympanic cavity is continued freely forward out of the anterior end of the bone, and terminates by a relatively wider outlet than in the *Delphinidæ*.

* Anatomie des Cetacés, plate xxiii.

Camper* states that the size of the tympanum is relatively smaller in the Cachalots than in the Whalebone Whales.

In the *Balænopteræ* the tympanic bones, according to Cuvier, are very small in proportion to the head, and are equally convex at their inferior surface.

As none of the fossils in question have been found, *in situ*, with any part of the cranium, their relative size to the animal cannot be judged of; but in the specimens that have been least injured and waterworn, the inferior surface shows the flattened or gently concavo-convex undulation which characterizes the tympanic bone in the true Whales (*Balæna*).

1455. A fragment of bone, smooth on one side, and on the opposite showing a coarse cetaceous bony texture, and petrified like the fossils from the red crag.

From Harwich Cliff, Essex.

Hunterian.

1456. A similar fragment, from the same locality.

Hunterian.

1457. A fragment of bone, smooth on both sides, but with a marginal fracture displaying a coarse cetaceous bony texture : it is completely mineralized, and in the condition of the fossils of the red crag.

From Harwich Cliff, Essex.

Hunterian.

1458. Two similar fragments of bone, from the same locality.

Hunterian.

1459. A fragment of bone of a coarse cetaceous texture, petrified and in the condition of the fossils from the red crag.

From Harwich Cliff, Essex.

Hunterian.

Order MARSUPIALIA.

Genus *Diprotodon*.

1460. The anterior extremity of the right ramus of the lower jaw of the *Diprotodon australis*, Owen, exhibiting the rough articular surface of the broad and deep symphysis, the base of the large incisive tusk, the second and

* *Loc. cit.* p. 108.

third molars, and the socket of the first. The third molar is the most entire ; its grinding surface is produced into two high subcompressed transverse ridges, placed one before the other ; there is also a ridge along both the anterior and the posterior parts of the base of the crown. The exposed commencement of the fangs is invested with a thick coating of cement ; a portion of this substance also remains in the interspace between the posterior eminence and its basal ridge ; the enamel is thick and presents a rugose or finely reticulate and punctate exterior, the perforations being seen at the fractured margins to lead to smooth pits, extending a little way into the enamel. The antero-posterior diameter of this tooth is two inches, the transverse diameter is one inch three lines ; the extent of the three sockets of the molars is four inches five lines ; they progressively diminish in size from the third to the first. The second molar is much narrower than the third, but its crown seems also to have supported two principal transverse eminences, and an anterior and posterior basal ridge : its antero-posterior extent is one inch and a half ; its transverse diameter at the posterior division, where it is thickest, is nine lines : the coronal ridges are broken off. The first molar is lost ; but its socket shows that it was implanted, like the other molars, by two fangs. The anterior part of the symphysis and crown of the large incisor are broken off ; from the first molar to the fractured end measures six inches three lines ; this part of the margin of the jaw manifests no trace of tooth or socket. The incisor tooth extends forwards and slightly upwards ; it is subcompressed, measuring one inch and a half in the vertical diameter and nearly one inch in transverse diameter ; it has a partial coating of enamel, which extends over the inferior and the lower half of the exterior surface of the tusk ; the enamel has the same rugose punctate outer surface as that of the molar teeth. The large size of the dental canal exposed by the posterior fracture of the ramus indicates the ample supply of vessels and nerves which minister to the growth and nutrition of the incisive tusk ; the great depth of the symphysis of the jaw gives the required strength for the operations of the tusk, and space for its support and for the lodgement of its large persistent matrix. The vertical diameter of the symphysis anterior to the molar series is four

inches. The symphyseal surface, contrasted with the molar teeth, seems enormous ; its antero-posterior extent to the fractured end of the jaw is six inches, its vertical diameter three inches ; its direction is obliquely from below upwards and forwards, its upper or posterior margin nearly straight, its lower or anterior one convex ; it stands out a very little way from the vertical plane of the inner surface of the ramus. The thickest part of the symphysis of the jaw does not exceed three inches ; this is at its lower part, which is convex in every direction. The surface of the bone seems to have been naturally roughened by minute vascular grooves and ridges ; it has been crushed and cracked. The ridge, which doubtless formed the anterior part of the base of the coronoid process, begins to stand out below the socket of the third grinder ; the smooth abraded surface at the back of the posterior talon of that tooth indicates the pressure against a contiguous tooth in the portion of jaw which has been broken away.

This symphyseal portion of jaw differs in a striking degree from the corresponding part in the known existing or extinct Pachyderms, which have, like the Australian extinct Mammal, a single incisor tusk in each ramus of the lower jaw. In the young Mastodon the tusk is situated in a less deep, more suddenly contracted and more produced symphysis ; the symphysis of the jaw in the Sumatran and incisive Rhinoceros is much less deep and is broader in proportion ; the peculiar deflection of the symphysis in the Dinotherium makes it differ still more strikingly from the Diprotodon, in which the incisive tusks of the lower jaw extended obliquely upwards. The sudden slope of the toothless margin of the jaw anterior to the molares distinguishes the existing Proboscidiæ, which have a smaller ankylosed symphysis and no lower tusks.

In the proportion of the symphyseal articulation to the molar teeth, I know of no quadruped that so nearly resembles the present large Australian fossil as the Wombat ; but in this Marsupial that part of the ramus of the jaw is broader in proportion to its depth : in these dimensions, viz. the proportions of breadth to depth of the jaw supporting the anterior molares, the Kangaroo more resembles the Diprotodon ; and the molars of the Kangaroo in their double roots and double-ridged crowns are those amongst the Marsupials which most nearly resemble the molars in the

present gigantic fossil. But the still closer resemblance which the molars of the Tapir bear to those of the Diprotodon calls for further and more decisive evidence before the supposition of its marsupial nature can be entertained with probability.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, westward of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir Thomas L. Mitchell, C.B.

1461. A portion of the left ramus of the lower jaw of apparently the same individual *Diprotodon australis*; it includes the two fangs of the last molar teeth and the angle of the jaw. This part more decidedly manifests the marsupial character by its inward inflection, and by the broad flattened surface which the under part of the jaw there presents: this surface forms a right angle with the outer surface of the ramus, the lines of union being rounded off; the outer surface, which is entire to the base of the coronoid process, is slightly concave. The Elephants, Mastodons and tapiroid Pachyderms present the opposite or convex form of the outward surface of the jaw; the Dinotherium comes nearest, amongst the Pachyderms, to the character of the angle and base of the ascending ramus of the jaw manifested in the present fossil, which, however, in the greater degree of inflection and flattening of the angle, more closely resembles the marsupial type. The alveolar ridge is continued backwards, for the extent of two inches, in the form of a flattened platform of bone, forming an angle at its inner and posterior extremity. The thin base of the coronoid process extends along the outer border of this platform, and the entry of the dental canal is situated near the posterior end of the base of the coronoid. The condyloid process and the back part of the jaw are broken away; a great part of the thick ridge formed by the inwardly inflected angle of the jaw has also suffered fracture, but about one inch of the middle part of this characteristic structure is entire. The preserved fangs of the last molar show it to have been as large as would comport with the proportions of the molars in the preceding specimen.

From the alluvial or newer tertiary deposits of the Condamine River, westward of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir Thomas L. Mitchell, C.B.

1462. The body of a dorsal vertebra of a large quadruped, probably the *Diprotodon australis*. It measures two inches three lines in antero-posterior diameter, three inches in vertical diameter, and four inches nine lines in transverse diameter. Both articular extremities are flat; the epiphysial plates are anchylosed; but where they are broken away the radiating rough lines, characteristic of the epiphysial surface, indicate that the union was tardy and had been recently effected before the animal perished. This vertebra differs by its compressed form and the flattening of the articular ends from the dorsal vertebræ of the ordinary placental Pachyderms, but resembles in these characters the dorsal vertebræ of the Proboscidiæ; in these, however, the breadth of the vertebral body is not so great as in the fossil. From the cetacean vertebræ the present fossil is distinguished by the large concave articular surface at the upper and anterior part of the side of the body for the reception of part of the head of a rib: this costal surface, which is not quite entire, appears to have been about an inch and a half in diameter. The neurapophyses are anchylosed to the centrum, but the internal margins of their expanded bases are definable, and have been separated by a tract, rather less than an inch in breadth, of the upper surface of the centrum; at the middle of this surface there is a deep transversely oblong depression: a similar depression is present in the dorsal vertebra of the Megatherioid animal, No. 507, and in the anchylosed lumbar vertebra of the Mylodon, No. 398; but the bodies of the dorsal vertebræ in all the great extinct *Bruta* are longer and narrower in proportion to their breadth than in the present fossil. The upper and posterior margin is here indented on each side by the dorsal nerve, which in the Echidna perforates the base of the neurapophyses; otherwise the body of the dorsal vertebra in that Implacental corresponds in its proportions and in the depression on the upper part of the body with the present fossil. In the Kangaroo the upper surface of the body of the dorsal and lumbar vertebræ is perforated by two vascular canals, which pass down vertically and open below by a single or double outlet. In the Wombat the middle of the upper surface of the bodies of the dorsal and lumbar vertebræ exhibits a single large and deep depression, which, in the dorsal vertebræ, has no inferior out-

let, and in this character they closely resemble the present fossil. The dorsal vertebræ of the Wombat are, however, longer in proportion to their breadth. Thus the present mutilated vertebra alone would support the conclusion that there had formerly existed in Australia a mammiferous quadruped, superior to the Rhinoceros in bulk, and distinct from any known species of corresponding size; and it is interesting to find one well-marked character in it, viz. the median excavation on the upper part of the body, repeated by one of the largest of the existing Marsupialia.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1463. A fragment of a vertebra, including the anterior and posterior articular processes, of the left side, the left half of the neural arch, and part of the anterior articular end of the body. The upper part of the spinal canal is nearly flat, but divided by two parallel longitudinal ridges into three nearly equal grooves; the transverse diameter of the canal at its anterior outlet is one inch one line; the vertical diameter appears not to have exceeded half an inch; the transverse diameter of the vertebra across the anterior articular processes is four inches and a half, and across the posterior processes is four inches; the length of the neural arch at the base of the spine is two inches nine lines. The proportion of the spinal canal to the vertebra indicates this to be from near the root or the base of the tail; but the remains of the anterior articular end of the body show that the vertebræ were here joined by ball and socket joints. A transverse process, which extended outwards from below the anterior articular process, has been broken off. The spinous process is much compressed and almost obsolete anteriorly; its base is three lines thick posteriorly.

This very remarkable fragment has the same colour and mineralized condition as the jaws of the *Diprotodon australis*, and is from the same stratum and locality, viz. the Condamine River.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1464. A fragment of a vertebra, with the left anterior and posterior articular or oblique process, and part of a thick transverse process. The proportions, colour and mineralized condition of this fossil agree with those of the portions of jaw, Nos. 1460 and 1461, of the *Diprotodon australis*.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1465. A fragment of a rib, which is nearly six inches in circumference.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1466. A fragment of a rather smaller rib, from near its vertebral end.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1467. A fragment of a rib of rather smaller size, from near the vertebral extremity.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1468. A fragment of a rib, four inches and a half in circumference.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1469. A fragment of a rib of a flatter form, and probably from a more posterior position.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1470. A fragment of the vertebral end of a rib, including its tubercle, below which it measures three inches and a half in circumference.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

All the preceding portions of ribs present the same colour and mineralized condition as the portions of jaw of the *Diprotodon australis*, Nos. 1460 and 1461.

1471. A fragment of the left scapula, with four inches of the anterior part of the base of the spine, of a large mammalian animal. The thickness of the neck of the scapula is two inches nine lines, that of the base of the spine is one inch. The indication of the sudden rising of this thick spine from the plane of the scapula distinguishes it from that bone in the Rhinoceros, and its thickness is greater than in the largest Hippopotamus ; it is also relatively greater in comparison with the neck of the scapula than in the Elephant. The fossil presents the same mineralized, crushed and fractured condition, and the same colour and texture of bone as the portions of the jaw of the *Diprotodon australis*, Nos. 1460 and 1461.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1472. A portion of the glenoid cavity and neck of a scapula of a large mammalian animal. The breadth of the articular surface for the humerus is between three and four inches ; the length appears to have been about six inches. The fragment is massive, and in the same mineralized, crushed and cracked condition as the portions of the jaw of the *Diprotodon australis*, Nos. 1460 and 1461.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1473. A fragment of apparently the same scapula, from the same stratum and locality.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1474. Two fragments, one apparently of the tuberosity of a humerus, of a large mammalian animal.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1475. Part of the distal half of the shaft of the left humerus of a large mammalian animal, showing the musculo-spiral impression between the origin of the deltoid process and the outer condyle. The breadth of the bone at this part seems to have been between four and five inches, its thickness is one inch eight lines; it indicates a compressed form of the bone as in the Wombat, and agrees in this feature, as in size, with the femur, No. 1489. In colour and mineral condition it corresponds with the portions of the jaw of the *Diprotodon australis*, Nos. 1460 and 1461.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1476. The proximal end of the left ulna of a quadruped corresponding in size with the *Diprotodon australis*. The olecranon is trihedral, smooth and concave on each side, rough and flattened posteriorly; the circumference of its base is eight inches; its summit is broken off, and the articular surface of the sigmoid cavity, which projects from the shaft of the bone, is unfortunately too much mutilated and fractured to convey an idea of its original form, or give evidence of the presence or amount of rotation between this bone and the radius. The breadth of the base of the olecranon is three inches, its thickness at its posterior expanded and flattened part is two inches three lines. This fossil indicates a massive and powerful fore-arm, and, by the size of the fractured end of the shaft of the bone, that the ulna extended to the carpal joint, and had an equal if not superior development to the radius. The canal for the medullary artery enters on the inner side below the sigmoid cavity, and is directed inwards and a little upwards. The fossil presents the same colour and mineralized, broken and cracked condition as the portions of the jaw of the *Diprotodon australis*, Nos. 1460 and 1461.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1477. A portion of a condyle of a humerus or femur, of the proportions apparently of those of a Mastodon ; it presents the same colour and heavy mineralized and cracked condition as the fossils Nos. 1460 and 1461.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1478. A portion of one of the condyles of a femur, presenting nearly the proportions of that of a Mastodon, and in the same heavy mineralized and broken condition as the fossils Nos. 1460 and 1461.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1479. A fragment of the compact walls of the shaft, apparently from the inner border of a flattened femur : the length of the fragment is seven inches and a half, and the thickness of the compact wall from one-half to two-thirds of an inch. It corresponds in colour and mineralized condition with the portions of the jaw of the *Diprotodon australis*, Nos. 1460 and 1461.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1480. A fragment of apparently the head of a tibia of a quadruped, agreeing in size with the *Diprotodon australis* : the portion of articular surface here preserved is gently concave at one part and convex at another, with a deeper depression near the margin ; the greatest breadth of this surface is five inches.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1481. A portion of the inner part of the proximal end of a right tibia of a large mammalian animal : the part of the concave articular surface which is preserved has a diameter of three inches and a half, but the traces of the union of the epiphysis to the shaft are very plain ; the lower end of

the fragment, which is six inches long, presents no appearance of a medullary cavity. This fossil has the same general colour and heavy mineralized condition as the portions of the jaw of the *Diprotodon australis*, Nos. 1460 and 1461.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1482. A fragment of the shaft of a long bone of the same size and texture as the preceding, and perhaps forming part of the anterior wall of the same tibia.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1483. A fragment of the shaft of one of the long bones of the extremities, apparently the tibia, of a large quadruped: the exterior shows a portion of two almost flattened surfaces meeting at an open angle, from which a short rough ridge-like process is developed; at the upper part of this ridge the orifice of the medullary artery is situated, the canal of which expands as it slightly descends to gain the medullary cavity; no part of that cavity is distinctly visible in the fossil; the compact part of the wall is half an inch thick, and a moderately close cancellous texture is continued inwards from it; at the upper part of the fragment the compact wall is about a quarter of an inch thick; the breadth of the fragment, which seems to include about one-fifth part of the circumference of the bone, is two inches and a half. The ridge, near which the medullary artery penetrates the tibia in the larger Pachyderms and Ruminants, is situated at the confluence of two surfaces of the tibia, which meet a much less open angle than in the present fossil: in the Giraffe the corresponding angle is rounded off. In the Elephant and Mastodon the medullary artery perforates the bone at the middle of the flattened posterior surface of the tibia. In the Kangaroo the ridge near which the arterial orifice is situated is much more acute and more produced than in the fossil. In the Wombat the corresponding orifice is situated at the ridge where the

two flattened facets of the shaft of the tibia meet at the same open angle, as in the present fragment, which accords in size, colour and mineralized condition with the portions of the jaw of the *Diprotodon australis*, Nos. 1460 and 1461.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1484. The distal end, apparently of a fibula, of a large mammalian quadruped: it presents a subtriangular form, and is seven inches in circumference; the centre of the shaft is occupied by a close cancellous texture; the articular extremity is much abraded, but a trace of the line of union of the epiphysis to the shaft may be discerned. This fragment presents the same ponderous mineralized condition as the preceding specimen.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1485. A fragment of apparently the proximal end of a long bone of a large quadruped. It is triangular, slightly twisted, and acquires a form which yields an oval transverse section as it descends. A portion of a nearly flat articular surface projects obliquely forwards, and from above downwards and inwards: the upper part of this surface is defined by a groove, which sinks into a slight depression; above this the bone rises in the form of a broad flattened process, which has been broken off about two inches below the articular surface; there is the orifice of a canal for the medullary artery, which, on the supposition that this is a proximal end of the bone, is directed slightly upwards; the broken end of the bone below this part shows no medullary cavity, but a close cancellous texture, bounded by a compact wall from one to two lines in thickness: the circumference of this extremity of the fragment is seven inches. It presents the same heavy mineralized condition as the foregoing specimens.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1486. The right os calcis of a large mammalian quadruped. It measures six inches in length and five inches and a half in breadth; presents two large articular surfaces at right angles to each other upon its upper and anterior part; has a short calcaneal or posterior process, which is broad, depressed and bent upwards, and a short thick obtuse process directed downwards from the internal and under part of the bone. The inner and upper articular surface is semicircular, nearly flat, very slightly concave, with a small part continued down or sinking from the middle of its outer margin at a rather open angle, towards the outer or cuboidal facet. This is a larger and more deeply concave surface than the preceding, with a well-defined margin placed on the outer side, not anterior to the astragalar surface. The astragalar surface is separated from the calcaneal and inferior tuberosity by a wide and moderately deep tendinal groove, analogous to that along which the tendon of the flexor longus pollicis glides in Man. The base of the calcaneal process, which is united to the posterior part of the cuboidal concavity, is perforated by a short canal, half an inch wide, continued downwards and forwards, and leading to a wider tendinal groove, which impresses the inferior surface of the part of the bone supporting the cuboidal facet. The plane of the posterior part of the calcaneal projection is at right angles with the inferior rough surface of the bone.

The characters of the present fossil calcaneum, as above briefly defined, are unique. The size of the bone leads us first to compare it with the calcaneum of the Elephant or Mastodon, but here we find two broad and flat astragalar surfaces on the upper part of the bone, and a small and very slightly concave surface anteriorly; there is likewise no perforation for a peroneal tendon. The same absence of such a perforation, and the different proportion and relative position of the cuboidal facet, distinguish at a glance the calcaneum in all the ordinary Pachyderms from the present fossil. The calcaneum of the *Mylodon robustus* is perforated at its outer part for the tendon of the 'peroneus longus,' as it is in the present fossil; it likewise has a stout tuberosity projecting from its under surface, but the calcaneal process is much larger and is continued more directly backwards. The cuboidal facet in the *Mylodon* is much smaller

and shallower than in the present fossil, and is not only placed anterior to the astragalar surface, but is continuous with it. Not to dwell on the differences which the comparative anatomist must have immediately perceived from the description of the present most remarkable bone in the corresponding one of the *Ruminantia*, the *Quadrumana*, the *Carnivora* and *Rodentia*, I proceed at once to state that it is only in the equipedal Marsupialia, and more especially in the Koala and Wombat, that we find the articular surfaces of the calcaneum two in number and of the same general form, proportions and relative position as in the fossil under consideration: the nearly flat internal and superior astragalar surface is, however, proportionally narrower in the Wombat; its outer depressed angle is shallower; the calcaneal projection is directed downwards and inwards; the strong peroneal tendon indents the outer side of the calcaneum with a groove but does not perforate the bone. The calcaneum of the Kangaroo has a totally different form from the fossil; in the leaping Marsupialia the heel is subcompressed and much elongated; the astragalar surface is divided into two small distinct parts; the cuboidal facet is anterior, and convex vertically, &c. In conclusion, it may be stated that the large fossil calcaneum here described combines the essential characters of that of the Wombat, with some features of that of the Mylodon and Mastodon, and others which are peculiar to itself: the single broad astragalar surface, with its external depressed portion, coincides with the characters of the large fossil astragalus No. 1509, though the different form of the astragalar surface appears to show the present calcaneum to belong to a distinct species of marsupial Pachyderm.

That a large quadruped, whose nature and affinities that term expresses, formerly inhabited Australia, the characters of the present os calcis would alone have rendered highly probable: and since the same conclusions are deducible from the portions of jaw Nos. 1460 and 1461, which correspond in size, mineralized condition, locality and stratum with the present calcaneum, it is highly probable that they all belong to the *Diprotodon australis*, a species whose affinities to the Wombat were perceived by the characters of the single tusk and fragment of jaw transmitted by

Lieut.-Col., then Major Mitchell, from the caves of Wellington Valley, Australia, to the Geological Society, and which is described in his ' Expedition into the Interior of Eastern Australia,' 8vo, 1838, vol. ii. p. 362.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

Of the River Condamine, which is in lat. 28° S., long. 150° E., Sir Thomas Mitchell states, " This stream, as I understand, is remarkable from forming large basins at some places and losing its course in swamps at others, and at other parts again cutting its course in a deep channel, through deep beds of alluvium, in which these bones are thus brought to light."

The three following specimens were transmitted together, and are referred to in the following extract from a letter from Lieut.-Col. Sir T. L. Mitchell, dated " Sydney, N.S. Wales, 6th April, 1842," addressed to Prof. Owen, Royal College of Surgeons.

" I write now chiefly to apprise you of my having sent by the same vessel, which will take the mail and this letter (namely the ' Everetta'), a box containing some fragments of fossil bones addressed to you. These are not satisfactory specimens such as I hope soon to send you ; but, being the first from the locality, I am anxious you should first hear of them. I can tell you but little of the manner in which they occur ; but such bones are found on Darling Downs, those extensive plains which you will see marked to the S.W. of Moreton Bay, on most maps of this country. They are at the sources of the Darling River, and at a great height above the level of the sea, upwards of 4000 feet. I am informed that these huge bones (of which I send you but fragments) are found in some abundance.

" What will interest you most is a tooth, which I have put up amongst these fragments, being from the same locality ; it is packed in the same kind of paper, so I hope care will be taken to find it. I thought it safest among the fragments, as such a small article at the

top might fall out at the Custom House. I am promised part of a rib and other bones by the gentleman who gave the tooth, and I have some hopes of obtaining a jaw-bone.”

1487. A portion of the crown of the penultimate molar, right side, lower jaw, of the *Diprotodon australis*: it includes a great part of the posterior transverse eminence, which is more than half-worn down, with the posterior talon and a small part of the anterior eminence: the wrinkles of the enamel are fewer, and the perforations more distinct than in the specimen No. 1460, but the size and proportions so closely accord with those of No. 1495, as to leave little doubt of their specific identity. The smooth indentation at the back of the posterior talon plainly indicates the effects of pressure, from long exercise of mastication, against a posterior tooth.

From the alluvial or newer tertiary deposits in the Darling Downs, S.W. of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1488. A fragment of the spine of a scapula of a large quadruped; it is between one inch and half an inch in thickness, and two inches in height: the cancellous texture resembles in character that of the femur No. 1489, which was transmitted with this fragment.

From the alluvial or newer tertiary deposits in the Darling Downs, S.W. of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1489. The shaft of a femur of a large mammiferous quadruped, wanting part of the parietes of the medullary cavity from the fore-part of the distal half of the bone. It is principally remarkable for the extent to which it is naturally flattened from before backwards; its transverse being to its antero-posterior diameter as two to one; the greatest length of the specimen is one foot ten inches; its greatest breadth near the upper end is nine inches. Among the known larger quadrupeds the femur presents a similar antero-posterior compression in the Elephant, Mastodon, and Rhinoceros, but the latter animal is distinguished by a second

external trochanter, situated below the great trochanter, which is not present in the Australian fossil. In the *Megatherium* and its congeners the flattening of the femur and its transverse breadth greatly surpass the proportions exhibited by the fossil under consideration, or those of the femora of the proboscidian *Pachyderms*.

The femur of the *Mastodon* is that which the Australian fossil most resembles, in being flatter on the posterior than on the anterior surface. Compared with the femur of the *Mastodon giganteus*, the fossil presents the following differences: it is broader in proportion to its length; as, for example,

	Australian femur. in. lines.	<i>Mastodon</i> . in. lines.
From the lower part of the post-trochanterian depression		
to the prominence above the outer condyle	18 0	24 0
Breadth of middle of shaft of femur	5 0	5 9
Circumference of do. do.	13 6	14 6

The surface of the bone below the post-trochanterian depression is more convex in the Australian fossil, and the prominence above the back part of the outer condyle is more developed; the small trochanter is narrower and longer, and is defined by a groove along its anterior part. The femur in the *Mastodon giganteus* thins off almost to an edge at the outside of the distal half of the shaft: in the Australian fossil the corresponding part is broad and convex. The anterior part of the great trochanter rises higher above the level of that part of the femur in the Australian fossil than in the *Mastodon*. The orifice of the medullary artery is conspicuous in the Australian fossil at the back part a little above the middle of the shaft, and towards the inner side; the canal slopes upwards: I cannot detect the corresponding orifice in the *Mastodon's* femur compared. The Australian fossil exhibits a large medullary cavity along the middle of the shaft, with dense parietes an inch thick.

This specimen appears to be too large in proportion to the molar tooth of the *Diprotodon*, No. 1487, to have belonged to that animal; and as the molar tooth of a *Mastodon*, closely resembling the *Mastodon angustidens*, has been discovered in Australia by Count Strelingsky, the

present femur may have belonged to a young individual of the Australian Mastodon.

From the Darling Downs, S.W. of Moreton Bay.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

The following specimens of the *Diprotodon australis*, from No. 1490 to No. 1503 inclusive, were discovered by Patrick Mayne, Esq. during the operations of sinking a well near Mount Macedon, in the district of Melbourne, near Port Philipp, Australia.

1490. The under part of the base of the left incisive tusk of the *Diprotodon australis*; showing the line where the rugose-punctate, as if worm-eaten, enamel ceases at the angle between the under and inner surfaces of the tusk, and the coat of cement covering the unenameled dentine: the smooth pulp-cavity gradually widening to the base of the tusk is exposed to the extent of three inches. This portion of a great incisor is identical in form and structure with the specimen from the bone-cave of Wellington Valley, figured and described in Sir T. L. Mitchell's 'Expeditions into Australia,' vol. ii. p. 362, pl. 31. fig. 1 and 2, and with that from the Condamine River, No. 1460. *Presented by Dr. Hobson.*

1491. A fragment of the right ramus of the lower jaw of the *Diprotodon australis*, with the anterior fang and posterior half of the crown and fang of apparently the second molar; the summit of the posterior ridge has just begun to be worn, and a transverse crescentic line of dentine, with the concavity turned forwards, is exposed. The broken anterior fang displays the longitudinal indentation or channel with which its posterior surface is impressed: the posterior fang is similarly impressed longitudinally upon its anterior surface. The reticulo-punctate character of the enamel is well expressed. The sockets of the two fangs of the small anterior molar are traceable in this fragment.

From the alluvial or newer tertiary strata in the district of Melbourne, Australia. *Presented by Dr. Hobson.*

1492. The crown and beginning of the fangs of the antepenultimate molar, right side, lower jaw, of the same *Diprotodon australis*: the form of the

two transverse eminences, the summits of which had just begun to be abraded by mastication before the animal perished, is better displayed than in No. 1449 : they are more compressed than in the Tapir and Dinotherium, and their lamelliform summits rise higher beyond their basal connections than in the Kangaroo : the median connecting ridge which extends between the two transverse eminences longitudinally or in the axis of the jaw, in the molars of the Kangaroo, is very feebly indicated in the *Diprotodon* : the anteriorly concave curve of the summits of the transverse ridges is more regular and equable and greater than in the tapiroid *Pachyderms*, the *Dinotherium*, or the Kangaroo. The two fangs, the contiguous surfaces of which present the deep and wide longitudinal groove, as in the tapiroid *Pachyderms* and the Kangaroo, are connected together at their base by a ridge coated thickly with cement and extending longitudinally between the beginnings of the opposite grooves.

From the alluvial or newer tertiary deposits in the district of Melbourne, Australia.

Presented by Dr. Hobson.

1493. The second molar tooth, left side, lower jaw, of the *Diprotodon australis*, from an older individual than the preceding. The anterior fang is broken off, the posterior one is preserved to the extent of one inch and a half ; the crown of the tooth is entire, except where the summits of the two transverse ridges have been abraded by mastication : it demonstrates, what is obscurely indicated in No. 1460, that besides the two principal eminences there is a small anterior basal ridge and a thick obtuse posterior ridge ascending a little obliquely from the outer to the inner side of the tooth : from the anterior and posterior extremities of each basal ridge, a lower ridge extends upwards to the summit of the principal eminence ; these eminences are also connected together by a short ridge at the outer and at the inner part of their basal interspace, and each of the principal eminences swells out near the middle of their interspace ; indicating, as it were, the median longitudinal ridge which connects the two chief transverse eminences in the crown of the molar of the Kangaroo. The enamel presents the same rugose-reticulate and punctate surface as in the molars Nos. 1469 and 1487, that character being more conspi-

cuous in the fore and back part of the coronal eminences than upon their outer and inner side. The outer border of the transverse eminences is more convex than the inner one. The course of the calcigerous tubes is unusually clear upon the broken surface of the fang.

From the alluvial or newer tertiary deposits in the district of Melbourne, Australia.

Presented by Dr. Hobson.

1494. The third or antepenultimate molar, left side, lower jaw, wanting the anterior fang, of the same individual *Diprotodon australis*. Like the preceding tooth it shows that it belonged to an older, and likewise to a rather larger individual than No. 1492: the crown has been more worn, and shows better the depth of the interspace between the two principal ridges, the slight production of the middle of the posterior surface of the anterior ridge, and the depression on the opposite surface of the posterior ridge. The antero-posterior extent of the base of the crown of this tooth is one inch nine lines; the breadth of the crown is one inch three lines; the height of the crown is one inch two lines; the length of the posterior fang was two inches when entire.

From the alluvial or newer tertiary deposits in the district of Melbourne, Australia.

Presented by Dr. Hobson.

1495. The crown of the penultimate molar, left side, lower jaw, of apparently the same individual *Diprotodon australis*. The anterior transverse ridge had just begun to be worn: the summit of the posterior ridge is entire. This is not divided into small mammilloid tubercles as in the *Dinotherium*, but is irregularly and minutely wrinkled as in the Tapir. In the depth of the cleft between the two transverse ridges, the teeth of the *Diprotodon* resemble those of the Tapir more than those of the Kangaroo; but the eminences are higher and more compressed than in either of the existing genera cited. In the largest existing species of Kangaroo, as the *Macropus major* and *Macr. laniger*, the lower molars have no posterior talon or basal ridge; but this is present in the still larger extinct species called *Macropus Atlas*, in which, however, it is much smaller than the anterior talon. In the Tapir the anterior talon is also larger than the posterior one, but in the *Diprotodon* the proportions of the two basal ridges are

reversed. The reticulo-punctate markings are present at the anterior surfaces of the enamel of the transverse ridges of the molars in the Tapir, whilst in the Kangaroo and Dinotherium the enamel is smooth and polished: the molars of the *Diprotodon* are characteristically distinguished by the rugose-punctate markings in both the anterior and posterior surfaces of the transverse ridges.

The breadth of the crown of the present tooth is one inch and a half, and the height of the entire posterior division is the same.

From the alluvial or pleistocene tertiary deposits in the district of Melbourne, Australia. *Presented by Dr. Hobson.*

1496. The anterior part of the anterior transverse eminence of the last molar, left side, lower jaw, of the same *Diprotodon australis*: it measures one inch nine lines across the base, and diminishes in breadth more gradually towards the summit than in the preceding tooth. The summit of this eminence had just begun to be worn by mastication: the pulp-cavity is continued into the basal third of the crown.

From the alluvial or pleistocene tertiary deposits in the district of Melbourne, Australia. *Presented by Dr. Hobson.*

1497. The two fangs of a posterior molar of the *Diprotodon australis*.

From the alluvial or newer tertiary deposits in the district of Melbourne, Australia. *Presented by Dr. Hobson.*

1498. Fragments of a caudal vertebra, equalling in proportions the fragment of jaw and the teeth Nos. 1490 to 1496; and in the same condition as to colour and loss of animal matter.

From the alluvial or newer tertiary deposits in the district of Melbourne, Australia. *Presented by Dr. Hobson.*

1499. A fragment of a rib: it is one inch and a half broad and from six to nine lines thick; equalling in size the anterior rib of a large Rhinoceros, and presents the same colour and absorbent condition as the fragment of jaw of the *Diprotodon australis*, No. 1460, with which it agrees in its proportions.

From the alluvial or newer tertiary deposits in the district of Melbourne, Australia. *Presented by Dr. Hobson.*

1500. A fragment of the scapula, with part of the base of the spinous process, of a large mammalian quadruped, corresponding in size, in general appearance and absorbent condition with the teeth and portion of jaw, Nos. 1490 to 1497, of the *Diprotodon australis*.

From the alluvial or newer tertiary deposits in the district of Melbourne, Australia. *Presented by Dr. Hobson.*

1501. An epiphysial proximal articular extremity apparently of a humerus of a young but large mammalian quadruped, agreeing in proportions, colour and absorbent condition with the teeth and fragment of jaw, Nos. 1490 to 1497, of the *Diprotodon australis*.

From the alluvial or newer tertiary deposits in the district of Melbourne, Australia. *Presented by Dr. Hobson.*

1502. A considerable proportion of the shaft of a long bone, apparently a radius, of a smaller quadruped: it is eight inches in length and three inches in circumference: it presents the same colour and absorbent desiccated condition as the fossils Nos. 1490 to 1497, with which it was found associated and was transmitted to the Museum.

From the alluvial or newer tertiary deposits in the district of Melbourne, Australia. *Presented by Dr. Hobson.*

1503. A portion of the shaft of the right femur of most probably the *Diprotodon australis*: it measures eight inches and a half in length and the same in circumference at the middle part: it closely corresponds in form with the larger femur No. 1489, being compressed from before backwards, flattened posteriorly, slightly convex anteriorly, with the rudiment of a ridge (but the bone is evidently from a young animal) on the outer border of the posterior surface, and showing the orifice of the medullary artery near the opposite border, at the beginning of the proximal expansion of the bone: the medullary canal is directed slightly upwards. Most of the cancellous texture of the bone has perished, and the rest is in the same absorbent condition and of the same colour as the specimens, Nos. 1490 to 1497, of the *Diprotodon australis*, with which it was found associated and was transmitted to the Museum.

From the alluvial or newer tertiary deposits in the district of Melbourne, Australia. *Presented by Dr. Hobson.*

1504. The proximal half of the shaft of the right femur of a quadruped as large as that to which teeth of the *Diprotodon australis*, Nos. 1490 to 1497 inclusive, and the femur No. 1503, belonged.

This fragment measures eleven inches in length, and three inches in breadth at the distal fractured end, where the circumference is seven inches and nine lines, the femur there not having begun to enlarge for the formation of the distal condyles. The long and narrow trochanter minor is developed from the posterior angle of the inner border of the upper expanded part of the fragment, and resembles in form that of the gigantic femur No. 1489, though it is more posterior in position: the base of the trochanter major begins to swell outwards and forwards from the anterior angle of the opposite border and encroaches upon the anterior part of the shaft: it is relatively lower and swells out more abruptly than in the femur No. 1489; there is no trace of a third trochanter. The post-trochanterian depression resembles that in No. 1489. The shaft of the present fossil is more flattened anteriorly than in No. 1503: this antero-posterior compression gives it the same resemblance to the femur of the Mastodon and Elephant as has been pointed out in the description of No. 1489. The large extinct phyllophagous Edentata manifest this character in an exaggerated degree: the Rhinoceros is the only genus amongst the ordinary Pachyderms in which the femur is flattened as in the great extinct Australian quadrupeds, but the third trochanter effectually distinguishes that bone in the Rhinoceros. It is evident, from the differences above detailed between the present femur and No. 1503, that they belong to distinct though perhaps to nearly allied species. The form of the transverse section of the shaft is more regularly elliptical, and the anterior surface more flattened, in the present fragment than in No. 1503, which, from its closer resemblance with No. 1489, might well have belonged to a young individual of the same species.

The present fossil was detached by Count Strzelecki from the breccia of one of the caves in Wellington Valley, Australia: the peculiar red ferruginous matter of the breccia still adheres to parts of the exterior and fills the interior cavity of the bone.

Presented by Count Strzelecki.

Genus *Nototherium**

1505. The right ramus, with the symphysis of the lower jaw, of the *Nototherium inerme*, Owen, a quadruped apparently manifesting another pachydermal modification of the marsupial type.

The dentition in the present jaw consists of molar teeth exclusively, four in number, which increase in size as they approach the posterior part of the series : a small portion of the anterior end of the symphysis is broken away, but there is no trace there of the socket of any tooth, and it is too contracted to have supported any tusk or defensive incisor. The length of the jaw is eleven inches : the molar series, which commences one inch in advance of the posterior border of the symphysis, is six inches in extent ; each tooth is implanted by two strong and long conical fangs, the hindermost being the largest, and both being longitudinally grooved upon the side turned to each other. The first tooth is wanting, and the crowns of the rest are broken away : the base of the third remains, which gives an indication of a middle transverse valley, which most probably separated two transverse eminences. This jaw resembles that of the proboscidian Pachyderms in the shortness of the horizontal ramus ; and of the Elephant more particularly in the rounding off of the angle, and in the convex curvature of the lower border of the jaw from the condyle to the symphysis, and also in the smaller vertical diameter of the symphysis, and the more pointed form of that part. It resembles the jaw of the Elephant in the form, extent and position of the base of the coronoid process ; but it differs from the Elephant in the concavity on the inner side of the posterior half of the ramus of the jaw, which is formed by an inward inflection of the angle : this concavity extends forwards beneath the sockets of the last two molar teeth. It differs from the Elephant in the greater flatness of the outer part of the angle of the jaw, in which respect it more resembles the Mastodon. In the extent of the angle of the jaw it is intermediate between the Mastodon and Elephant. It differs from

* νόρος the south, θηρίον beast.

both in the inward bending of that angle, which is remarkable for the great longitudinal extent along which the inflection takes place : most of the inflected angle has been broken away, but enough remains to demonstrate a most instructive and interesting correspondence between the present fossil and the characteristically modified lower jaw in the marsupial animals. In pursuing the comparison of the Australian pachydermal fossil with the Mastodon and Elephant, we may next observe that the alveolar process on the inner side of the base of the coronoid, behind the last molar, is as well developed as in the Mastodon; a similar angular production of this part exists in the Wombat and Kangaroo. The vertical extent of the outer concavity of the coronoid process is greater in the Australian fossil than in the jaw of the Mastodon and is less clearly defined below, in which respect the *Nototherium* resembles more the Elephant. The dental canal commences by a foramen penetrating the ridge which leads from the condyle to the post-molar process, and apparently just below the condyle, as in the Elephant, but it is relatively much smaller : it does not communicate with any canal leading to the outer surface of the ascending ramus, as in the Wombat and Kangaroo ; but this external opening is not present in all Marsupialia.

The anterior outlet of the dental canal is smaller than in the Mastodon and more anterior in position, and so far resembles the Elephant. The number, and apparently the form of the teeth, approximate the Australian Pachyderm more closely to the Mastodon than to the Elephant ; but the equal size of the last and penultimate teeth, which had the same number of divisions of the crown, are points in which the *Nototherium* still more nearly resembled the *Diprotodon*, the *Tapir* and Kangaroo.

In the general shape of the jaw, however, the *Nototherium* differs widely from all existing Marsupials and all known ordinary Pachyderms, and in the chief of these differences it resembles the lower jaw of the Proboscidiens. It resembles these, however, in common with the Wombat, in the forward slope and curvature of the posterior margin of the ascending ramus extending from the condyle to the angle, in the inward production of the post-molar process, in the position of the base of the

coronoid process exterior to the hinder molar, in the thickness of the horizontal ramus as compared with its length and the convexity of its outer surface ; and it also resembles the Proboscidiens, in common with the Kangaroo, in the small number of the grinding teeth.

From the lower jaw of the Kangaroo and Wombat that of the *Nototherium* differs in the absence of the deep excavation on the outer side of the ascending ramus, which, in those Marsupials, leads to a perforation in the base of that part of the jaw, and it also differs in the inferior depth of the inner concavity and the inferior extent of the inward production of the angle of the jaw ; besides the more important difference in the absence of the large incisor tooth. From the jaw of the *Diprotodon*, No. 1460, the present fossil differs in the much smaller vertical extent of the symphysis, and in the convexity of the jaw at its outer and anterior part, and more particularly in the absence of the incisive tusk and its socket ; but it must have closely resembled the *Diprotodon* in the general form and proportions of the molar teeth.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1506. The posterior half of the left ramus of the lower jaw of the *Nototherium Mitchelli*, wanting the condyloid and the upper part of the coronoid processes, and containing the last two molar teeth, the crowns of which are much fractured, but demonstrating that they were divided into two principal transverse ridges. The antero-posterior extent of both teeth together is three inches three lines, the last molar being two lines longer in this dimension than the penultimate one : its transverse breadth is one inch two lines. The dentine of the crown is encased in a sheath of enamel of nearly one line in thickness, with a smooth and polished surface, impressed at the outer part and near the base of the tooth, where the enamel is principally preserved, with fine parallel and nearly horizontal transverse lines

Part of the abraded surface of both transverse ridges is preserved in the penultimate grinder, showing that they had been more than half

worn away by mastication at the period when the animal perished. The smooth and polished exterior of the enamel covering the anterior part of the posterior eminence presents a striking contrast to the reticulo-punctate character of the enamel at the corresponding part of the molar in the *Diprotodon*, which in the general form and proportion of this part of the jaw so closely agrees with the present fossil. The *Diprotodon australis* exceeded, however, the *Nototherium inerme* in size, so far as can be judged by the lower jaw and teeth.

The penultimate and last molar teeth in the present specimen do not exceed in any comparable dimension those in No. 1505, which from the length of the fangs were as completely developed, and belonged therefore to a mature animal; but the depth of the jaw below the middle of the penultimate molar in the present fossil is three inches three lines, and in No. 1505 it is only two inches nine lines: the thickest part of the jaw beneath the same molar in No. 1506 is two inches three lines, but in No. 1505 it is one inch eleven lines. In No. 1505, the external wall of the alveolar process immediately swells out to form this thick part of the ramus, but in the present jaw it maintains its thinness for an inch below the margin of the socket; and the outer part of the jaw is slightly concave here, before it begins to swell into and form the bold convexity which is continued to the thick inferior border of the jaw. This difference in the shape, as well as the size of the jaw, bespeaks at least a specific distinction from No. 1505. But a more marked distinctive character in the present fossil is afforded by the relative position of the last molar tooth, which is in advance of the origin or base of the coronoid process, instead of being internal to and hidden by that part when the jaw is viewed from its outer side. The outer surface of the anterior part of the base of the coronoid appears by a fracture there to have projected outwards further in the present specimen than in No. 1505.

The important marsupial character afforded by the inward bending of the angle of the jaw is well manifested by the present specimen, in which the angle is entire: it is thick, obtuse and inflected, slightly produced in comparison with the Wombat or Kangaroo, but it bounds a well-marked

concavity which extends forwards to the parallel of the interspace between the last and penultimate molars; the regularity of the convex line extending from the posterior part of the ascending ramus to the lower border of the jaw is interrupted by a slightly produced obtuse prominence at the middle of the inflected angle. The post-molar part of the alveolar process forms a broad platform on the inner side of the base of the coronoid, and is defined by a well-marked angle at its inner and posterior part, in which it resembles both the lower jaw of the proboscidian *Pachyderms* and that of the Wombat. The entry of the dental canal is situated as in the *Diprotodon australis* and the *Nototherium inerme*. The coronoid process has the same extensive antero-posterior origin, and the same thinness as in No. 1505, but it is rather more concave externally.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1507. A segment of the right ramus of the lower jaw of the *Nototherium inerme*, including the sockets of the penultimate and last molars, with the posterior fang of the one and the anterior fang of the other. The empty portions of the sockets show the longitudinal ridge of bone which fits into the groove on that surface of the fang which is towards the centre of the socket. The origin of the coronoid process opposite the anterior part of the last molar is a repetition of the character by which the entire jaw No. 1505 differs from the specimen No. 1506, and the length of the posterior part of the socket of the last molar establishes the full maturity of the present as of the entire jaw No. 1505. The concavity along the lower part of the inner surface of the ramus, formed by the bending in of its lower margin continued from the angle of the jaw, is well indicated in the present fragment, which likewise shows the course of the dental canal along the outer part of the bottom of the alveoli.

This fragment of jaw demonstrates a coarser cancellous structure than in the Rhinoceros, or even than in the Elephant.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1508. A fragment of the anterior part of the right ramus of the lower jaw of a mammalian quadruped as large as the preceding, and with molar teeth of the same size, apparently a *Nototherium*. It shows the sockets of the three anterior molar teeth, with the base of the fourth and the hinder fang of the third implanted in the jaw. The lower fractured surface exposes the dental canal extending obliquely from without inwards below the sockets of the anterior molars, and then bifurcating; the outer and larger division terminating at the mental foramen, and an inner and smaller one extending forwards nearer the symphysis, but without any trace of the socket of a large incisor. The first molar tooth is situated anterior to the commencement of the symphysial union, as in No. 1505, but there is no indication of the base of the coronoid process exterior to the fourth molar as in that specimen. The gradual expansion of the jaw below that tooth is more like that in the *Nototherium Mitchelli*, to which species the present fragment may with most probability be referred.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1509. The astragalus of a large marsupial quadruped, probably the *Nototherium inerme*. The peculiarities of this astragalus will be obvious to the comparative anatomist from the following description. It is a broad, subdepressed and subtriangular bone, the angles being rounded off, especially the anterior one; the upper or tibial surface is quadrate, concave from side to side, in a less degree convex from before backward: a ridge extending in this direction divides the tibial from the fibular surface, which slopes outwards at a very open angle, and maintains a nearly horizontal aspect, presenting an oblong trochlea for the support of the fibula, shallower, and one-third smaller than that for the tibia. The tibial articular surface is not continued upon the inner side of the astragalus, but

its anterior and internal angle, which becomes convex in every direction, is directly continued into the anterior scaphoidal convexity, which sweeps round a deep and rough depression, dividing the outer and anterior part of the tibial trochlea from the corresponding half of the scaphoidal convexity; this has the greatest vertical extent at its inner part, where it is separated by a narrow rough transverse channel from the part which rested upon the os calcis. The calcaneal surface is single and covers almost the whole of the under part of the astragalus: the greatest proportion of it is flat and reniform; an angular tuberosity or process being continued from the concave margin, where the pelvis of the kidney, to pursue the comparison, would be situated. This process must be received into a corresponding depression at the outer part of the articular surface upon the calcaneum. On the inner margin of the flat calcaneal surface opposite the tuberosity, a small triangular flattened surface is continued upwards upon the inner and posterior side of the astragalus, and nearly touches the inner and posterior angle of the tibial trochlea.

The length of this fossil astragalus is four inches eight lines; its breadth is three inches five lines; its depth (at the base of the scaphoidal convexity) is two inches and a half. We look in vain amongst the Pachyderms with astragali of corresponding dimensions for the uniform and prominent convexity of the anterior articulation, for its continuation with the tibial trochlea, and for the single and uninterrupted calcaneal tract on the lower surface of the bone. The Proboscidiæ, which approach nearest the present fossil in the depressed form of the astragalus and the flattening of the calcaneal articulation, have that articulation divided into two surfaces by a deep and rough groove: the scaphoidal surface is likewise similarly divided from the tibial trochlea; and no Pachyderm has the upper articular surface of the astragalus traversed by an antero-posterior or longitudinal ridge, dividing it from an almost horizontal facet for the support of the end of the fibula.

The peculiar form of the astragalus in the Ruminants, and especially the trochlear character of the anterior or scapho-cuboidal surface, place it beyond the pale of comparison. In all the placental Carnivora the scaphoidal convexity is pretty uniform, and occupies the anterior extremity

of the astragalus, as in Man and Quadrumana, but it is more produced and supported on a longer neck, which is also more oblique than in the Quadrumana, where the astragalus already begins to recede, in this character, from the Human type. In the Seals the upper surface of the astragalus somewhat resembles the present fossil in the meeting of the tibial and fibular facets at an obtuse angle formed by a longitudinal rising, but the fibular surface is rather the wider of the two, and the tibial one is divided by a broad rough tract from the scaphoidal prominence; and in addition to this anterior production of the bone there is also another process from its posterior part, which, as Cuvier remarks, gives the astragalus of the Seal the aspect of a calcaneum. By some of the remarkable peculiarities which the astragalus presents in the Order *Bruta*, it approaches the Australian fossil under consideration; as in the Mylodon, for example, where the surface for the calcaneum is single and undivided. But in this great extinct leaf-eating quadruped the calcaneal facet is continued into the navicular facet, which, on the other hand, is separated by a rough tract from the tibial articulation, as in all the Edentata, recent and fossil. The latter character likewise distinguishes the astragalus of the Rodentia from the fossil astragalus under consideration.

In the Ornithorhynchus the astragalus has a deep depression on its inner side for the reception of the incurved malleolus of the tibia, and in both the Ornithorhynchus and Echidna the tibial surface is more convex than in the present fossil.

Amongst the existing Marsupialia, the astragalus in the largest herbivorous species, as the Kangaroos, offers very great differences from the present Australian fossil: the broad and shallow trochlea for the tibia is continued upon the inner side of the bone into a cavity which receives the internal malleolus; whilst the fibular facet is long and narrow, and situated almost vertically upon the outer side of the bone. The scaphoidal surface is unusually small, and convex only in the vertical direction; and is divided by a vertical ridge into two surfaces, the outer one being applied to the os calcis. The inferior and proper calcaneal articulation is divided into two small distinct surfaces, the outer one concave, the inner one concavo-convex.

Amongst the gradatorial and pedimanous Marsupials, and herein more especially the Wombat, we at length find a form of astragalus which repeats most closely the characters of the extraordinary fossil under consideration: in the astragalus of the Wombat the fibular facet, of a sub-triangular form, almost as broad as it is long, slightly slopes at a very open angle from the ridge which divides it from the tibial surface: this surface, gently concave from side to side, and more gently convex from behind forwards, repeats the more striking character of being directly continued by its inner and anterior angle with the large and transversely extended convexity for the os scaphoides. The calcaneal surface below is single and continued uninterruptedly from the back to the fore-part of the outer half of the under surface; and its outermost part is produced into an angle, which is received into a depression at the outer side of the upper articular surface of the calcaneum. Thus all the essential characters of the fossil are repeated in the astragalus of the Wombat. The differences are of minor import, but are sufficiently recognizable; thus, in the Wombat, the single calcaneal surface is directly continued into the cuboido-scaphoidal convexity, instead of being separated from it by a narrow rough tract, as in the fossil; the calcaneal surface is also narrower than in the fossil, and the outer angle is less produced: the division of the tibial trochlea for the inner malleolus is better defined in the Wombat, and the depression round which the continuous smooth surface between the tibial and scaphoid surfaces winds is less deep in the Wombat; the scaphoidal convexity is also less developed in the vertical direction in the Wombat.

We thus find that the great fossil astragalus from Australia, viewed in reference to the general characters of that bone in the mammalian class, offers great and remarkable peculiarities; and we further find that these are exclusively, but most closely repeated in certain Australian genera of Marsupialia, and especially in the bulkiest of the existing vegetable feeders, which are not saltatorial. The inference can hardly be resisted, that the rest of the essential peculiarities of the marsupial organization were likewise present in that still more bulky quadruped of which the fossil under consideration once formed part.

In the Kangaroo and the smaller leaping Marsupials the fibula is disproportionately slender and immoveably attached or ankylosed to the tibia, reminding one of the Ruminant type of organization ; it sustains little if any of the superincumbent weight, and has no resting-place upon the astragalus, the outer malleolus being simply applied to the vertical outer surface of that bone. The broad and nearly horizontal surface in the present fossil clearly bespeaks the existence in the same animal of a fibula which must have almost equalled the tibia in size at its distal end, and have taken as large a share in the formation of the ankle-joint as it does in the Wombat : we may in like manner infer that the tibia and fibula were similarly connected together, and, coupling this with the ball and socket joint between the scaphoid and astragalus, we may conclude that the foot of the great extinct Marsupial possessed that degree of rotatory movement which, as enjoyed by the Wombat, is so closely analogous to the pronation and supination of the hand. We finally derive from the well-marked marsupial modifications of the present fossil astragalus, a corroboration of the inferences as to the former existence in Australia of a marsupial vegetable-feeder as large as the Rhinoceros, which have been deduced from the inflected angle and other characters of the jaw of the Diprotodon and the Nototherium, and from the fossil calcaneum, No. 1485, which has been referred to the Diprotodon. The present bone closely agrees in all its marsupial modifications with that calcaneum, but the single flat surface which articulated with the calcaneum is longer in proportion to its breadth than in No. 1485. From this circumstance and the close agreement in colour and general condition which the present astragalus has with the jaw of the Nototherium, No. 1505, it more probably belongs to that genus ; but for demonstration further discoveries will be required of parts of the skeleton so associated as to justify the inference that they had belonged to one individual.

The present bone is from the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

Genus *Macropus*.

1510. A considerable proportion of the right superior maxillary bone of the extinct Titan Kangaroo (*Macropus Titan*, Owen), with five molar teeth *in situ*; the crowns of the first and second are broken away, those of the third and fourth are worn upon the summits of the two principal transverse ridges, and those of the fifth molar are entire. The posterior molars differ from those of the two largest existing species of Kangaroo, viz. the *Macropus major* and *Macr. laniger*, in the more distinct development of the posterior basal ridge, and in the more complex form of the median longitudinal ridge connecting the two principal transverse eminences; they present the same differences with a less proportional breadth of the tooth as compared with the equally gigantic extinct species called *Macropus Atlas*.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C. B.

1510'. A corresponding portion of the right superior maxillary bone of the great Red Kangaroo (*Macropus laniger*), with the four posterior or true molar teeth *in situ*; their roots are exposed from the outside. The animal to which this jaw belonged was killed by Mr. Gould between the rivers Murray and Adelaide, Australia; it measured eight feet two inches from the nose to the extremity of the tail, and was the largest Kangaroo which he saw in Australia, or of which any record has reached Europe.

Presented by John Gould, Esq., F.R.S.

1511. A portion of the right ramus of the lower jaw of the *Macropus Titan*, with the three posterior molar teeth; these differ from the corresponding molars of the *Macropus major* and *Macropus laniger*, as well as from those of the extinct *Macropus Atlas*, in the greater antero-posterior extent of the anterior basal ridge or talon, and from the latter species also in the greater antero-posterior extent of the base of the two principal transverse eminences and in the absence of the posterior

talon, in which latter character it resembles the large existing Kangaroos.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

- 1511¹. A portion of the right ramus of the lower jaw of a large male Red Kangaroo (*Macropus laniger*), with the four posterior molar teeth *in situ*: it belonged to the same individual as No. 1510¹.

Presented by John Gould, Esq., F.R.S.

1512. A fragment of the right ramus of the lower jaw of the *Macropus Titan*, with the posterior part of the last molar tooth, which shows the characteristic absence of the posterior talon in this great extinct species as compared with the *Macropus Atlas*: the depth of the jaw at the posterior part of this tooth is one inch two lines; the corresponding part of a very large male *Macropus laniger* is eleven lines: the wide excavation at the base of the coronoid process, which is continued into the dental canal, is well displayed in this fossil.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1513. A considerable proportion of the left ramus of the upper jaw of an immature Atlas Kangaroo (*Macropus Atlas*, Owen), containing the two deciduous molars and three of the permanent molars; the last is mutilated. The crown of the large premolar, characteristic of the present species, is exposed from the inner side in its closed alveolus. From the size of the teeth this specimen appears to have belonged to a young female.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1514. A small portion of the right superior maxillary bone of the *Macropus Atlas*, with the last, the penultimate, and part of the antepenultimate

molars *in situ*. The specific distinctions are well displayed in the comparison of the present penultimate and last molars with those in No. 1510; as for example, first, the greater breadth of the tooth in the present species, especially of its anterior division, as compared with its antero-posterior extent; secondly, the much smaller and lower posterior talon; and thirdly, the shorter and more simple connecting ridge between the two principal transverse eminences.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1515. A portion of the left ramus of the lower jaw of the *Macropus Atlas*, with the penultimate molar, and part of the antepenultimate molar *in situ*: the small posterior basal ridge distinguishes, better than the superior size of the animal, the present extinct Kangaroo from the largest of the existing species.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1516. A similar portion of the left ramus of another individual of the *Macropus Atlas*, with the penultimate molar, mutilated, the antepenultimate molar, and the next tooth in advance; the depth of the jaw below the penultimate molar is one inch two lines; the corresponding part in a large male *Macropus laniger* measures not quite one inch.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1517. A portion of the left ramus of the lower jaw, three inches and a half in length, and containing the sockets and fangs of five molar teeth, probably the entire series in use at one and the same time; the four molar teeth, which constitute the series in one side of the lower jaw of a large male *Macropus laniger*, occupy an extent of one inch nine lines: I have not seen any lower jaw of this species of Kangaroo, or of the more common *Macropus major*, with more than four molars in use at the same time,

although seven molars are successively developed in this genus on each side of both jaws: we seem, therefore, to have another distinctive character of the great extinct Kangaroos in the extent of their molar series, though this was probably a transient one; the number of molars decreasing with age. The depth of the jaw in the present fragment below the penultimate molar is one inch and a half: the arterial canal destined for the base of the socket of the large procumbent incisor, may be seen below the great dental canal on the anterior fractured end of the fossil, but the socket itself has not reached so far back.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1518. The right ramus of the lower jaw of a small species of Kangaroo, having the premolar and four true molar teeth in place and use. It presents a longitudinal indentation on the outside of the alveolar processes of the first two molars: the section of the jaw anterior to the molar series shows the socket of the great procumbent incisor to have extended further back than in the fossil. *Purchased.*

1519. A portion of the right superior maxillary bone of the *Macropus Atlas*, containing six molar teeth: the small anterior deciduous molar is fractured; the crown of the permanent premolar, the great antero-posterior extent of which distinguishes the present extinct species from the *Macropus Titan*, is exposed in its closed alveolus from within; the anterior end of this premolar is irregularly notched: the sixth molar had not cut the gum; its posterior half is lost: the molars in place correspond in character with those in No. 1513, which has formed part of a similar immature animal.

From one of the caves in Wellington Valley, Australia.

Presented by Count Strzelecki.

1520. A smaller portion of the right superior maxillary bone of an immature individual of the *Macropus Atlas*, with three molar teeth *in situ*, and the crown of the permanent premolar exposed by the removal of the

outer wall of its socket. A notched lobe projects from the posterior part of the outside of the crown of this tooth: the anterior end has been broken away.

From one of the caves in Wellington Valley, Australia.

Presented by Count Strzelecki.

1521. A considerable portion of the right ramus of the lower jaw of a *Macropus*, with the root of the large procumbent incisor and four of the molar teeth *in situ*.

From one of the caves in Wellington Valley, Australia.

Presented by Count Strzelecki.

1522. A fragment of the right ramus of the lower jaw of a *Macropus*, with the anterior molar and a portion of the second molar.

From one of the caves in Wellington Valley, Australia.

Presented by Count Strzelecki.

1523. A portion of the left ramus of the lower jaw of a very young Kangaroo, with two molar teeth still concealed in their sockets.

From one of the caves in Wellington Valley, Australia.

Presented by Count Strzelecki.

1524. A portion of the left ramus of the lower jaw of a Kangaroo (*Macropus affinis*, Owen), with the penultimate and antepenultimate molars, showing the crowns much worn by mastication: the crown of the last molar has been broken off, and there are the remains of two molars anterior to the antepenultimate one; the extent of the four posterior molars is one inch ten lines; the penultimate molar, besides its inferior size, differs from the corresponding tooth in the *Macropus Atlas*, in being narrower in proportion to its length, in having a relatively smaller anterior talon, and no posterior one; it differs *à fortiori* from the antepenultimate molar of the *Macropus Titan*, inasmuch as this has a larger proportional anterior talon than in the *Macropus Atlas*. The teeth and the jaw of this specimen closely agree in size with those of the large male *Macropus laniger*, No. 1511¹, but the inner lobes of the penultimate molar are

thicker in the fossil, and the jaw does not swell out so much on the outside of the alveolus of the last molar; there is also a longitudinal indentation on the outside of the alveolar processes of the anterior molars. The present fossil, therefore, indicates either an extinct species of the size of the existing *Macropus laniger*, or it may have belonged to a female of a third gigantic extinct species.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1525. The shaft of the right humerus of a Kangaroo, probably the *Macropus Atlas*: it differs from that bone in the recent species in the greater anterior production of the deltoidal process, in the greater lateral compression of the upper half of the shaft of the bone, and in the absence of the ridge which projects from the outer side of that part of the shaft of the humerus in the existing Kangaroos. A considerable part of the boundary of the perforation above the internal condyle is preserved; the commencement of the external or supinator ridge is visible on the opposite side of the bone, but not in the form of the hook curving upwards, as in the recent Kangaroos. The length of this fragment is five inches and a half; its circumference below the deltoidal ridge is three inches. There is no trace of a medullary cavity at either of the fractured ends, but the minute canal for the medullary artery may be seen, directed upwards, above the internal condyloid perforation.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1526. The distal half of the right humerus of another large species of Kangaroo, probably the *Macropus Titan*. It demonstrates the perforation above the inner condyle for the median nerve and brachial artery, and shows that the supinator ridge commenced higher up than in the preceding specimen. The circumference of the shaft of the present humerus below the deltoidal ridge is three inches and a half. There is no trace of a medullary cavity at the fractured end of the bone at this part, which displays only a close

cancellous texture. There is no canal for the medullary artery at the part corresponding to that in the foregoing fossil.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1526¹. The right humerus of a young Kangaroo, sawn across below the deltoid ridge to show the compact wall and large medullary cavity in that part of the shaft which is occupied by the close cancellous tissue in the preceding fossil. *Purchased.*

1527. The distal end of the left femur of a Kangaroo, probably *Macropus Atlas*, having a circumference of ten inches and a half, that of the same part in a full-grown male *Macropus major* being eight inches and a quarter. The extinct larger species offers the characteristic production of the outer and posterior angle of the outer condyle, and the depression at the side of the condyle above this process; it also presents the second depression in advance of the preceding, and the same disproportionate size of the outer division of the rotular surface, which is more convex in the fossil than in the recent Kangaroo. The transverse breadth of the posterior part of the outer condyle is relatively less, as compared with the same part of the inner condyle, than in the recent Kangaroo. The fossil is heavily impregnated with mineral matter.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1528. The distal end of the left femur of a second gigantic species of Kangaroo, probably *Macropus Titan*, which measures in circumference eleven inches and a half. In this species the breadth of the posterior part of the outer condyle is relatively greater than in the foregoing specimen, and the breadth of both condyles is relatively greater than the antero-posterior diameter of the distal articular surface: the outer division of the rotular surface is less convex than in the preceding species; the depression above that surface is shallower; that on the side of the inner condyle is deeper. The contour of the circumference of the distal end of the shaft

of the bone differs in a marked degree in the two extinct gigantic species. The characteristic production of the outer and posterior angle of the outer condyle and the deep small cavity above it are as well marked in this as in the preceding fossil.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1529. The distal end of the right femur of a smaller individual, perhaps a female, of the same species apparently as the preceding fossil: it shows that the inner division of the rotular articular surface is more prominent and extensive than in the *Macropus major*: the general correspondence is very close; the circumference of this fragment is ten inches.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1530. A segment, two inches long, from the middle of the shaft of the left tibia of a Kangaroo, probably *Macropus Titan*. On the fractured surface may be seen the characteristic compact walls of the medullary cavity, and the absence of a loose cancellous structure on the inner surface: the fragment also shows the commencement of that rough flattened surface, below the external ridge of the tibia, to which the fibula is attached. This fragment is four inches seven lines in circumference; the corresponding tibia, one foot nine inches long, of a large male *Macropus laniger* is three inches and a half in circumference at the corresponding part of the shaft.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1531. The os calcis of a Kangaroo, either *Macropus Atlas* or *Macropus Titan*: it measures four inches in length, but has belonged to a young animal, as the line of the junction of the terminal epiphysis is not obliterated. It differs from the os calcis of the *Macropus major* not only in size, but in

the confluence of the two superior articular surfaces for the astragalus, and the greater relative breadth of the external convex surface: the anterior cuboidal and scaphoidal facets are broader in proportion to their length, and the cuboidal one is defined below by a deep and narrow groove not present in the large existing Kangaroo: in other respects the characteristic peculiarities of the calcaneum of the Kangaroo are closely kept.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1532. A proximal phalanx of the longest toe of the hind-foot of a Kangaroo.

From the alluvial or newer tertiary deposits in the bed of the Condamine River, west of Moreton Bay, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

1533. A second phalanx of the longest toe of the hind-foot of a Kangaroo, probably *Macropus Atlas*: its basal or proximal end is broader in proportion to the length of the bone than in the large existing Kangaroos.

From one of the bone-caves in Wellington Valley, Australia.

Presented by Count Strzelecki.

1534. The shaft of an ulna of apparently a young Kangaroo.

From one of the bone-caves in Wellington Valley, Australia.

Presented by Count Strzelecki.

1535. A mutilated os calcis of a Kangaroo.

From one of the bone-caves of Wellington Valley, Australia.

Presented by Count Strzelecki.

Genus *Hypsiprymnus*.

1536. The alveolar process of the left superior maxillary bone of a young individual of the Cave Potoroo (*Hypsiprymnus spelæus*, Owen), with the deciduous premolar and three succeeding true molar teeth *in situ*: the

crown of the permanent premolar is exposed in the substance of the jaw.

From one of the caves in Wellington Valley, Australia.

Presented by Count Strzelecki.

1537. A fragment of the right superior maxillary bone of the Cave Potoroo (*Hypsiprymnus spelæus*, Owen), with the permanent premolar and two of the anterior molars in place. A scalpriform incisor of a murine Rodent animal is cemented to the above fragment by the same piece of ferruginous breccia.

From one of the caves in Wellington Valley, Australia.

Presented by Count Strzelecki.

1538. A portion of the left ramus of the lower jaw of a young Cave Potoroo (*Hypsiprymnus spelæus*). The deciduous premolar and the three following molar teeth are in place: the crown of the permanent premolar is exposed in the substance of the jaw below the deciduous one; the base of the socket of the large procumbent incisor is exposed at the fore part of the fractured jaw.

From one of the bone-caves in Wellington Valley, Australia.

Presented by Count Strzelecki.

1539. A portion of the left ramus of the lower jaw of a Cave Potoroo (*Hypsiprymnus spelæus*), with two molar teeth *in situ*.

From one of the caves in Wellington Valley, Australia.

Presented by Count Strzelecki.

Genus *Phascolomys*.

1540. The right superior incisor of Mitchell's Wombat (*Phascolomys Mitchelli*, Owen): it is thicker transversely, and flatter on the inner enamelled side than in the existing Wombat: the longitudinal groove on the concave unenamelled side of the tooth is shallower than in the smaller existing species.

From one of the caves in Wellington Valley, Australia.

Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.

- 1540¹. The right superior incisor of the existing Wombat of Van Diemen's Land (*Phascolomys Vombatus*). *Purchased.*
1541. A superior molar tooth of the *Phascolomys Mitchellii*.
From one of the caves in Wellington Valley, Australia.
Presented by Lieut.-Col. Sir T. L. Mitchell, C.B.
- 1541¹. A corresponding superior molar tooth of the *Phascolomys Vombatus*.
Purchased.
1542. A fragment of the lower jaw, with a molar tooth *in situ*, of the *Phascolomys Mitchellii*
From one of the caves in Wellington Valley, Australia.
Presented by Count Strzelecki.

Genus *Dasyurus*.

1543. A portion of the right superior maxillary bone of the great carnivorous Opossum (*Dasyurus lanarius*, Owen), with the two premolars and the first and second true molars *in situ*. These four teeth occupy an extent of one inch and a half; the corresponding teeth in the *Dasyurus ursinus* occupy an extent of one inch and a quarter: this, which is the largest known existing species of Dasyure, is at the present day confined to the island of Van Diemen.
From one of the caves in Wellington Valley, Australia.
Presented by Count Strzelecki.
1544. A fragment of the right ramus of the lower jaw, with the last molar tooth, of the *Dasyurus lanarius*: the antero-posterior diameter of the crown is seven lines and a half, that of the corresponding tooth in a full-grown *Dasyurus ursinus* being five lines.
From one of the caves in Wellington Valley, Australia.
Presented by Count Strzelecki.
1545. The antepenultimate or penultimate molar of the right side, lower jaw, of the *Dasyurus lanarius*.
From one of the bone-caves in Wellington Valley, Australia.
Presented by Count Strzelecki.

1546. A fragment of the left ramus of the lower jaw of the *Dasyurus lanianus*, with the first and second true molar teeth *in situ*.

From one of the bone-caves in Wellington Valley, Australia

Presented by Count Strzelecki.

1547. The second true molar, left side, lower jaw, of the *Dasyurus lanianus*.

From one of the caves in Wellington Valley, Australia.

Presented by Count Strzelecki.

1547¹. The crown of a canine tooth of the *Dasyurus lanianus*.

From one of the caves in Wellington Valley, Australia.

Presented by Count Strzelecki.

Genus *Thylacinus*.

1548. A portion of the left ramus of the lower jaw of the great Cave Thylacine (*Thylacinus spelæus*, Owen), with the first and second premolars *in situ*, and part of the socket of the canine and of the third premolar tooth. The present fossil is distinguished from the corresponding part in the large extinct and existing species of *Dasyurus*, by the compressed crowns of the premolar teeth, and by the interspaces which divide them from each other and from the third premolar tooth, also by the deeper and more compressed form of the lower jaw; in all which characters the present fossil agrees with the Great Dog-headed Opossum (*Thylacinus Harrisii*) of Van Diemen's Land*. The depth of the jaw below the first premolar tooth is nine lines in the fossil, that of the corresponding part of the jaw in the existing Thylacine is seven lines.

From one of the caves in Wellington Valley, Australia.

Presented by Count Strzelecki.

* A fine specimen of the anterior extremity of the lower jaw of the *Thylacinus spelæus* was obtained by Sir T. L. Mitchell from the bone-caves in Wellington Valley, and is figured in his 'Expeditions into Australia,' vol. ii. pl. 31. fig. 7, where (p. 363) I have described it as having the teeth wider apart than in the *Dasyurus ursinus*, which led me "to doubt whether it was the lower jaw of the *Dasyurus lanianus*, or of some extinct marsupial carnivore of an allied but distinct species." At that period there was no skull of the existing Thylacine in the Museum of the College. The subsequent acquisition of that rare animal has enabled me to refer both Sir Thomas Mitchell's specimens and those of Count Strzelecki to the genus *Thylacinus*, no species of which is now known to exist in the continent of Australia.

1549. The penultimate molar, right side, lower jaw, of the *Thylacinus spelæus*: it differs from the corresponding tooth in the *Dasyurus ursinus* or *Das. lamarius* in the larger and more distinctly developed third or posterior lobe, in which character it agrees with the existing Thylacine; but it presents a difference, as compared with the penultimate molar of that species, in having a small accessory cusp on the inner side of the large middle compressed cusp; which cusp is also less deeply and angularly divided from the anterior lobe of the tooth.

From one of the caves in Wellington Valley, Australia.

Presented by Count Strzelecki.

1549^l. The left ramus of the lower jaw of the Hyæna or Dog-headed Opossum of Van Diemen's Land (*Thylacinus Harrisii*).

Presented by Ronald Gunn, Esq.

Class AVES.

Order RAPTORES.

Family *Vulturidæ*.Genus *Lithornis**.

1550. A portion of the skeleton of the *Lithornis vulturinus*, Owen. This beautiful fossil includes the sternum nearly entire, the proximal ends of the coracoid bones, a dorsal vertebra, the distal end of the left femur, the proximal end of the corresponding tibia, and a few less characteristic fragments of ribs; all of which are cemented together by the grey indurated clay, which is generally more or less attached to the fossils from the isle of Sheppey, the locality from which the present specimen was obtained.

The length of the sternum and the remains of the great intermuscular crest or keel, forbid a reference of the fossil to the Struthious or strictly terrestrial Order, but at the same time do not prove so decidedly, as might be supposed, that the fossil must have belonged to a bird of flight. The Penguins and other *Brachyptera*, having need of muscular forces to work their wings as paddles while making their way under water, almost equal to those which propel the bird of flight through the air, possess a long sternum, with a well-developed keel. The coracoid bones or posterior clavicles are even less available in this question, as they relate much more closely to the respiratory actions than to the movements of the wings, and accordingly are always present and strongly developed, even in such birds as the Apteryx, in which the wings are reduced to their feeblest rudiments. In the present fossil, however, the lateral extent and convexity of the sternal plate, the presence and course of the secondary intermuscular ridges, the commencement of the keel a little way behind the anterior margin of the sternum, all prove the bird to which it belonged to have no affinity with the Brachypterous family of

* *λίθος* a stone, *ὄρνις* a bird.

web-footed birds, and lead us to survey the corresponding parts of the skeleton in the ordinary birds of flight.

Sufficient of the sternum remains for the rejection of the Gallinaceous, and those Grallatorial and Passerine birds which have that bone deeply incised; and the field of comparison is thus restricted to such species as have the sternum either entire or with shallow posterior emarginations. Between the fossil and the corresponding part of the skeleton of such birds, a close comparison has been instituted in regard to many minor details and modifications, as, for example, the secondary muscular impressions and ridges on the flat surface of the sternum; its costal margin and anterior angle; the form and extent of the coracoid groove; the conformation of the sternal end of the coracoid bone, combined with the form and relative size of the preserved articular extremities of the femur and tibia: but, without recounting all the details of these comparisons, it may be sufficient to state that, after pursuing them from the Sea-gull and other aquatic species, upwards through the Grallatorial and Passerine orders, omitting few of the species and none of the genera of these orders, to which belong British birds approaching or resembling the fossil in size, the greatest number of correspondences with the fossil were at length detected in the skeletons of the Accipitrine species.

The resemblance was not, however, sufficiently close to admit of the fossil being referred to any of the existing native genera of Raptorial birds. The breadth of the proximal end of the coracoid removed the fossil from the Owls (*Strigidae*), and the shaft of the same bone was too slender for the *Falconidae*; the femur and tibia were, likewise, relatively weaker than in most of our Hawks or Buzzards. It is with the skeletons of the Vultures that the fossil presents the closest agreement. In the small Turkey-Vulture (*Cathartes Aura*), for example, besides the same general form and proportions of the bones, so far as they exist in the fossil, there is the same degree of development, and the same direction of the intermuscular ridge on the under surface of the sternum, which divided the origins of the first and second pectoral muscles. The outer angle of the proximal end of the coracoid is produced in the same degree and form, and a similar intermuscular ridge is present on the anterior and

towards the outer part of the coracoid. The preserved extremities of the femur and tibia have the same conformation and relative size in the fossil as in the existing *Cathartes*. In this genus, nevertheless, there is a deeper depression on the outer surface of the sternum external to the coracoid groove, than in the fossil, but this difference is less marked in some of the large Vulturidæ. The fossil moreover indicates a smaller species of Vulturine birds than is known to exist in the present day, and it probably belonged to a distinct subgenus. The name *Lithornis* has, therefore, been proposed for it with the specific appellation *vulturinus*.

From the Eocene tertiary formation called the 'London Clay' at the Isle of Sheppey, Kent. *Hunterian**.

Order CURSORES (Struthious or Wingless Birds).

Genus *Didus*.

1551. The cast of the head of the Dodo (*Didus ineptus*, Linn.). The head of this extinct bird is remarkable for its large size in proportion to the entire bird, and for certain peculiarities of form; as, for example, the great breadth of the cranium compared with its length, the great depth of the beak compared with its breadth, and the sudden elevation of the frontal region above the root of the beak. The cranium forms rather more than one-fourth of the entire length of the skull. The occipital region is broad and appears flat; but part of the skull may have been here destroyed in the original process of stuffing the bird. The contour of the temporal depressions may be traced upon the sides of the cranium, separated above by an interspace of two inches and nine lines: the orbits are comparatively small, wide apart, the interorbital space being three inches across: the outer apertures of the ears are situated rather more than an inch be-

* Of the sixteen specimens referred to the Class of Birds in the original Hunterian Manuscript Catalogue of Fossils, every one belongs to the Class *Reptilia*, and the greater part to the genus *Pterodactylus*. The specimen above described is not included in that Catalogue.

hind and below the openings of the eyes. The nostrils are oblique and situated at the lower border and a little in advance of the middle of the upper mandible. The feathered skin of the head seems to have formed a transverse fold across the frontal region of the cranium, and a naked skin to have extended thence to a raised border arching above the nostrils over the upper mandible, where the gnathotheca or horny sheath of the bill commenced. The lower mandible is moderately deep, compressed, with a symphysis one inch and a half in length, sloping from below upwards and forwards. In this particular, as well as in the general form of the beak, the Auks, especially the great *Alca impennis*, resemble the Dodo; but in the genus *Alca* the beak is much more compressed, the nostrils are situated at its base, the forehead is relatively narrower, and does not rise so high or so abruptly above the base of the beak, the orbits are relatively larger and separated by a much narrower interspace, and the cranium is longer in proportion to its breadth and to the length of the beak.

The differences which the head of the Dodo offers in comparison with that of any of the Vulture-tribe, to which it has been supposed to have a close affinity*, are still greater. The symphysis of the lower mandible of the Vultures is neither compressed nor directed as in the Dodo: the nostrils present the same obliquity, but are situated further from the margin and nearer to the base of the upper mandible; the cranium, from the occiput to the anterior border of the orbits, is much longer in proportion to the beak than in the Dodo. On the other hand, the characteristic breadth of the skull and of the interorbital space, and the small size of the orbits, are repeated in the Apteryx; the nostrils have the same relative position in the Rhea, and are defended by a scale as in the Dodo; the naked cere above the base of the beak is present in the Ostrich, Rhea and Apteryx, but is less developed than in the Vultures and the Dodo.

An exquisitely finished miniature of the living Dodo in the celebrated painting by Savery † of 'Orpheus charming the Beasts,' in the collection

* See De Blainville, 'Mémoire sur le Dodo,' 4to. Nouvelles Annales du Muséum d'Histoire Naturelle, tom. iv. 1831.

† This artist died at Utrecht in 1639.

at the Hague (No. 139), verifies the later oil-painting by Edwards, which is preserved in the British Museum*, and confirms the accuracy of the original woodcuts published by De Bry †, Clusius ‡, Herbert §, and Bontius ||, in their respective works, so far as regards the struthious proportions of the wings and the gallinaceous structure of the legs and feet: both the rudimental wings and the tail were ornamented with loose plumes in the Dodo as in the Ostrich.

The original of the present cast is preserved in the Ashmolean Museum in the University of Oxford. It was the head of a stuffed specimen of Dodo originally in the collection of rarities belonging to John Tradescant, and was transferred with that collection to Dr. Elias Ashmole in 1674, and subsequently, by the munificence of Ashmole, to the University of Oxford. This specimen, No. 29 of Ashmole's catalogue, with others from No. 5 to No. 46 inclusive, "being decayed, were ordered to be removed at a meeting of the majority of the visitors, Jan. 8, 1755:" the skin was burnt, but the head and one foot were preserved.

The head alone yields evidence of a species of bird differing from any now known to exist. The cere or naked skin which invests the base of the bill is an example of a more extensive development of a structure present in the Apteryx, Rhea and Ostrich, as well as in the Raptorial birds. The nostrils, by their advanced position, repeat the characters of those of the Rhea; and in the figures of the recent bird they are represented as being defended by an overarching scale, as in the Rhea and the Gallinaceous birds. The sudden elevation of the forehead is a character which is most nearly repeated by the Apteryx, and is not manifested by any raptorial or short-winged aquatic bird: and the Dodo approaches nearest to the Apteryx in the great breadth of the cranium and the small size of the orbits and eyes. When the great diversity in the shape of the beak in the existing birds of the Struthious Order is

* This is a copy, made in 1760, from "an original picture drawn in Holland from the living bird brought from St. Maurice's Island in the East Indies, in the early times of the discovery of the Indies by the way of the Cape of Good Hope." See the excellent Article Dodo, in the Penny Cyclopædia.

† Quinta pars Indiæ Orientalis, MDCL.

‡ Exotica, 1605.

§ Travels, 1634.

|| Hist. Nat. et Med. 1658.

remembered, as exhibited by the Ostrich, Cassowary and Apteryx, there will appear but little reason in inferring that the descriptions and figures of the extinct brevipennate Dodo of the Isle of Mauritius were fabulous, because the upper mandible was hooked at the tip as in the Vultures, and the entire beak compressed and resembling upon the whole more that of the Raptorial than the known existing Struthious birds.

Presented by the Rev. Dr. Buckland, F.R.S.

Genus *Dinornis**.

The following specimens of great extinct Wingless Birds of the genus *Dinornis* are from the beds of small rivers descending from the mountains into Poverty Bay, Wairoa, New Zealand. They were transmitted by the Rev. W. Williams to Dr. Buckland and by him presented to the College.

1552. The cranial portion of the skull of a *Dinornis*, apparently *Dinornis struthoides*, Owen. It is remarkably depressed, very broad, subquadrate, in size and shape most like the corresponding part of the head of the Dodo, but gently and equably convex above, the cerebral hemispheres not raising their bony covering above the level of the rest of the calvarium, as in the Dodo, and the frontal region, though more elevated than in the existing Struthious birds, is apparently less suddenly raised than in the Dodo. The length of the present fossil is three inches, its greatest breadth three inches and a quarter, but the prominent parts of the sides of the skull are broken away: its breadth between the temporal fossæ, which are large and deep, is two inches five lines: its vertical diameter at the deepest part, from the upper occipital ridge to the under surface of the basi-sphenoid, is one inch and a half. The great occipital foramen is subcircular, and seven lines in diameter; its plane is vertical, and the single occipital condyle projects more freely backwards than in other birds beyond the upper margin of the hole, from which the occipital surface of the skull slopes forwards as it rises to join the upper surface. This inclination, with the slight depth and great

* *δεινὸς surprising, ὄρνις bird.*

breadth of the occiput, and the great breadth of the fore-part of the frontal region, form the most peculiar features of the present cranium. The occipital region above the foramen magnum is divided by three short obtuse vertical processes into four depressions, the two median ones being half the breadth of the two lateral, which are deeper than usual: each depression is bounded above by a convex border, which does not rise above the level of the calvarium to form a crest, but defines the occipital from the coronal surface.

A broad and deep depression separates the condyle on each side from the ex-occipital process forming the posterior boundary of the tympanum: the broad basi-sphenoid descends vertically for a quarter of an inch below, and at right angles with, the basi-occipital, separated from the condyle by two small but deep depressions: this development of the base of the skull is peculiar to the *Dinornis* among birds, and resembles that in the Crocodile. The upper boundary of each temporal fossa is well defined, but not elevated into a ridge; a smooth and very slightly convex surface of the cranium, one inch ten lines in breadth, intervenes between them; a continuation of the same surface, four lines in breadth, separates the temporal from the occipital fossæ. A cellular air-diploë, from two to six lines thick, divides the outer from the inner table of the cranium.

The mutilated base of the present specimen exposes the upper border of the pituitary depression, bounded anteriorly by the groove which lodged the optic chiasma, and from which the optic foramina are continued outwards and forwards to the orbits. The outlets of the optic foramina are separated by an interspace of one inch: the *Apteryx* amongst existing birds approaches nearest to the *Dinornis* in this peculiarity; but the *Dodo* most probably still more closely resembled the *Dinornis* in the distinctness of, and distance between, the two optic foramina. These foramina, in the present cranium of the *Dinornis*, are smaller than those in the skull of the *Ostrich*, and indicate it to have had a smaller eye, in which it must have resembled the *Dodo*. The olfactory foramina are subcircular, three lines in diameter, separated by an interspace of two lines: the olfactory cavities extend backwards behind these foramina upon the under surface of the cranium to within four lines of

the optic groove; a feature which, with the large size of the olfactory nerves, indicates a development of the organ of smell approaching that most remarkable one in the Apteryx. Of the other outlets of the cerebral nerves, those for the ninth pair are alone remarkable for any increase beyond the ordinary size.

The articular depressions for the tympanic or quadrate bones are imperforate, eight lines long, from three to four lines wide, bounded externally by a very short angular process.

The depressions on the occiput for the insertion of the nuchal muscles indicate the force with which they must have habitually operated upon the head; and the unusual size and depth of the temporal fossæ equally indicate the great strength of the gripe of the bill; such a combination of powerful muscles of the head and the beak accords with the indications which the vertebræ of the neck, and the short and strong metatarsi afford, of habits of scratching and uprooting ferns for food.

1553. A cervical vertebra of the *Dinornis giganteus*, Owen. This specimen appears to have come from below the middle of the neck, anterior to those which are distinguished by a median inferior spine.

The following are its dimensions as compared with the twelfth cervical of a full-sized Ostrich:—

	<i>Dinornis.</i>		<i>Struthio.</i>	
	In.	Lin.	In.	Lin.
Length, at the middle of the terminal articular surfaces	2	9	2	2
Breadth, at the middle of the body	1	6	0	8
Height of the middle of the body	1	1	0	8
Height from anterior base of spine to the lower part of the anterior articular surface	1	8	1	0
Length of the neural arch	1	9	1	5
Breadth of ditto	1	7	0	11

Every process and prominence of this vertebra of the *Dinornis* is broken off, with the exception of the right posterior oblique process. The texture everywhere presents large reticulate cancelli, which communicate with the outer surface by an orifice on each side the neural arch, behind the upper transverse process.

The body of the vertebra is square-shaped, with a broad and flat, or

slightly concave under surface : the anterior part of this surface is divided from the anterior articular surface by a transverse channel, that surface being raised to a higher level. This structure does not exist in the corresponding vertebræ of the Ostrich : it is slightly indicated in those of the Apteryx. The spinal canal presents the usual infundibular expansion at both extremities: it is not larger at its middle contracted part than in the Ostrich. The remains of the base of the spinous process show this to have been almost square-shaped, and much thicker relatively as well as absolutely than in the Ostrich.

1554. A posterior cervical vertebra of a large species of *Dinornis*, probably *Din. ingens*. It corresponds with those few cervical vertebræ at the base of the neck, which have a median inferior spinous process for giving a more extensive and advantageous origin to the great *longus colli anticus* muscle : it manifests the same massive proportions, squareness of the body, great breadth of its under surface, and thick four-sided spinous process as the foregoing vertebra.
1555. A posterior cervical vertebra of another large species of *Dinornis*, probably *Dinornis struthoides*; it is narrower in proportion to its length than No. 1554, but has a thicker spinous process, which, at the same time, is more compressed from behind forwards : the cavity behind the spine is deeper and more angular, as is also the notch between the posterior oblique processes. The anterior articular processes are raised higher above the body in the more robust vertebra, No. 1554. The anterior articular surface of the present vertebra has a much less vertical extent than in the thicker vertebra ; and the inferior spine is narrower, but of greater antero-posterior extent, and is situated nearer the posterior part of the body.
1556. The cast of an anterior dorsal vertebra of a large species of *Dinornis*, probably *Dinornis ingens* : it is either the first or second of the dorsal series : the inferior transverse processes manifest part of the concavity for the articulation of the head of the rib, and there is a spinous process from the under surface of the body of the vertebra, which, as in the anterior dorsal of the Apteryx, is less broad and flattened than in the ante-

rior cervicals. The upper transverse processes are continued, as in the first and second dorsals of the Apteryx, from the anterior part of the whole side of the neural arch, not, as in the Ostrich, from near the summit; these processes also, as well as the spinous process, are considerably thicker and stronger than in the Ostrich. In regard to the spinous process, the Dinornis, in the squareness of that part, differs as much from the Apteryx, in which the dorsal spines are compressed laterally and extended antero-posteriorly, as from the Ostrich.

The original of the present cast was brought from New Zealand by the officers of the Antarctic Expedition, and is preserved in the Museum of Haslar Hospital.

Presented by Dr. Richardson, F.R.S.

1557. A dorsal vertebra of a smaller species of Dinornis, probably *Dinornis didiformis*, Owen. It is from about the middle of the dorsal region. The body is laterally compressed, and terminates below in a median carina, which has a concave outline: it has the characteristic shortness as compared with the breadth of the vertebræ in this genus; the anterior articular surface is more concave from side to side, and the posterior surface more convex in the same direction than in the corresponding vertebræ of the Ostrich or Apteryx: both these surfaces have an unusual vertical diameter in proportion to their breadth. The spinous process of this vertebra is strong and square-shaped, and shows, like the preceding dorsal, that there was no blending together of the spines, nor any union by continuous splint-like ossifications, as in many birds, and especially in those that fly. The dorsal region in the skeleton of the Dinornis, by the intervals separating the spinous processes, must have resembled that in the large existing *Struthionidæ*, and have differed from the same part in the Apteryx, in which the dorsal spines are contiguous though not confluent; but the Dinornis surpassed all known birds in the thickness and squareness of its upright spinous processes. Of the length of these processes none of the five vertebræ afford an exact idea, all being more or less fractured. The spinal canal is proportionally more contracted than in the Ostrich, or even in the Apteryx, where it is rather smaller than usual. This character in the Dinornis indicates, of course, a more slender spinal chord, in which respect it betrays a closer approach to the Reptilia. We

may associate, with such a condition of the spinal marrow, less delicate perception, and less energetic muscular action; and the vertebræ thus confirm the original induction* from the texture of the femur, that the *Dinornis* was a more sluggish or less active bird than the Ostrich.

1558. A portion of the os sacrum and anchylosed iliac bones of the *Dinornis giganteus*. This portion of the pelvis consists of twelve anterior anchylosed vertebræ of the sacrum, with a portion of the right ilium and acetabulum. Of the size of this fine fragment an idea will be conveyed to those who have not seen the original by the subjoined table of its dimensions, compared with those in a full-sized Ostrich.

	<i>Dinornis.</i>		<i>Struthio.</i>	
	In.	Lin.	In.	Lin.
Height of the first sacral vertebra	6	10	4	6
Breadth of the articular surface of the body of ditto .	3	4	1	8
Breadth of the seventh sacral vertebra	3	3	1	3
Length of the first seven sacral vertebræ	6	6	6	9

The last admeasurement shows that the anterior part of the sacrum, including the first series of vertebræ provided with double transverse processes on each side, is shorter in proportion to its height and breadth as compared with the Ostrich; and these proportions are shown by the smaller specimen, No. 1561, to characterize the entire pelvis in the genus *Dinornis*. The under surfaces of the first seven vertebræ are flattened, and form a smooth and slightly concave platform in the remaining four. The inferior transverse processes pass out horizontally to the lower border of the ilium, which descends to the level of the under surface of the bodies of the sacral vertebræ. In the Ostrich they ascend obliquely upwards to join the upper transverse processes, before abutting against the lower border of the ilium, which does not descend so low as the bodies of the vertebræ. In the Ostrich the first two inferior transverse processes of the sacrum retain their primitive condition of detached ribs, and three transverse processes succeed them before the commencement of the os pubis †. In the great *Dinornis* the second sacral rib is anchylosed as a transverse process, and

* See Proceedings of the Zoological Society for November 1839.

† See description of the sacrum in Birds, in the 'Cyclopædia of Anatomy,' art. AVES, p. 271.

four other processes succeed this before the one which abuts against the beginning of the pubis : this is much thicker and stronger than the preceding ones, and it is succeeded by four confluent sacral vertebræ, which have no lower transverse processes. In the Ostrich the transverse processes of the sixth sacral vertebra abut against the part of the innominatum from which the pubis is continued, and the transverse processes of the four succeeding vertebræ abut against the origin of the ischium, parallel with the lower part of the acetabulum ; then a single vertebra without a lower transverse process or sacral rib intervenes before these are again developed in succeeding vertebræ, to abut against the posterior part of the acetabulum. The four ribless sacral vertebræ which in the *Dinornis* are interposed between those which send their anchylosed ribs to abut upon the os innominatum anterior to the acetabulum, and those which strengthen in like manner the posterior part of the acetabulum, are very short ; their bodies have coalesced into a single mass of bone, smooth and flattened below, rounded at the sides, and only recognizable as distinct bones by the orifices for the nerves at the sides of the anchylosed mass : these orifices are double, as in the sacrum of other birds*, the two roots of the nerves escaping separately, the motor root issuing by the lower, the sensitive root by the upper orifice. The upper transverse process of the first sacral vertebra is a broad and thick piece of bone, extending from the body and anterior articular process of the vertebra, and having a deep and smooth excavation at its anterior part : in the Ostrich the corresponding part is much smaller, and is reticulated by the bars of bone dividing the orifices by which the air is admitted into the interior of the vertebra.

1559. A large portion of the right os innominatum, including the entire acetabulum of a *Dinornis*, probably *Din. ingens*. This must have come from a bird of smaller size than the one to which the above-described portion of the sacrum belonged. The part of the ilium before and above the acetabulum rises with a steep slope and a slight general concavity to meet its fellow above the spinous crest of the anterior part of the sacrum : behind

* *Cyclopædia of Anatomy*, art. *AVES*, p. 271. The Ostrich is the only exception to this rule with which I am acquainted.

the acetabulum the outer surface of the ilium is divided into two facets, the upper one nearly horizontal, the lower one vertical, save where it arches out to the flat articular surface behind the acetabulum. The ridge dividing these two facets commences anteriorly above the middle of the acetabulum, and describes a regular curve in its course backwards, the convexity being downwards: in the Ostrich the corresponding ridge forms two curves, meeting at an angle above the prominent articular surface behind the acetabulum, and the convexity of both curves is upwards; from the angle an obsolete ridge extends down to the prominent articulation, and divides the anterior from the posterior vertically concave surfaces of the ilium: in the great *Dinornis* the corresponding surfaces are uninterruptedly continuous above the acetabular prominence. The posterior wall of the acetabulum is incomplete, as in other birds; the smooth articular surface is continued upon an oblong prominence above and behind the cavity. The pubis, a slender bone, as usual in birds, springs from a protuberance at the lower part of the acetabulum. The ischium is continued more directly from the lower and back part of the cavity: a very slight ridge indicates the posterior boundary of the notch for the tendon of the obturator internus, and the upper border of the notch is nearly straight. In the Ostrich this part is concave, and a well-developed process extends down, but does not join the pubis at the back part of the obturator notch. The *Apteryx* resembles the great *Dinornis* in this part of the pelvis. The ischium becomes compressed and gradually expands vertically as it extends backwards, its lower margin forming almost a straight line. In the Ostrich the ischium maintains its trihedral form for a much longer extent and suddenly expands, the lower margin curving down to join the pubis: there is no indication of such a junction in the present specimen, nor does the superincumbent ilium curve down, as in the Bustard, to join the ischium: both the ischiadic and the obturator notches seem to have been unclosed by bone in the *Dinornis* as in the *Apteryx*.

1560. This is a part of the right os innominatum, including the posterior and inferior angle of the acetabulum, the origins of the pubis and ischium, which form the obturator notch, and a fractured continuation of the

latter bone, of a large species of *Dinornis*. The fragment has belonged to a pelvis intermediate in size between Nos. 1559 and 1561, but is nearer the former. From this it differs in the concavity of the upper boundary of the ischiadic notch, and the descending process forming its posterior boundary, which almost touches the pubis. The posterior margin of the wall of the acetabulum is straight, and ascends at a right angle with the horizontal ischium. In the larger pelvis, No. 1559, as in the smaller one, No. 1561, this margin curves back at less than a right angle. The ischium is thinner and less convex internally.

1561. The almost entire pelvis of a smaller species of *Dinornis*, probably *Dinornis dromioides*, Owen. It seems to include all the sacral vertebræ, which are eighteen in number: seven anterior ones with the lower transverse processes, four without those processes, and seven in which they reappear, extending obliquely outwards and backwards to the line of junction of the ilia with the broad posterior part of the sacrum. The most important feature in the present pelvis is the demonstration of what was obscurely indicated in the foregoing specimen, viz. that the ilia do not, as in existing *Struthious* birds, including the *Apteryx*, approximate one another along the whole length of the sharp and narrow ridge formed by the spines of the sacrum, but that they diverge above the acetabula, to give place to a broad horizontal expanse of bone developed from the posterior sacral spines, as in the *Bustard* and most other birds. This surface forms a smooth shallow concavity, perforated as usual by two lateral series of small foramina. From the pelvis of the *Bustard* that of the *Dinornis* differs in the greater relative depth and verticality of the anterior plates of the ilia, which meet above to form a ridge, as in the existing *Struthionidæ*: the posterior expanded part of the pelvis is relatively shorter than in the *Bustard*, and the difference is extreme which this part of the pelvis of the *Dinornis* presents, as compared with that of the *Apteryx*, the *Ostrich*, the *Emeu*, and *à fortiori* the *Rhea*, in which the ischiadic bones meet, and are united for a considerable extent below the posterior part of the sacrum, which there becomes almost obliterated. The acetabula are relatively nearer to each other than in the *Bustard*, but further apart than in the *Ostrich*, *Emeu*, and relatively than in the

Apteryx. There is likewise another difference in the relative position of the acetabula as compared with the Ostrich: in this bird those cavities are so situated that their posterior wide orifice exposes to view the neural arches and spinous processes of the intervening sacral vertebræ. In the *Dinornis* only the lower part of the bodies of the corresponding vertebræ are seen by looking directly into the acetabulum, and below these we have the open cavity of the pelvis: the *Apteryx* and *Emeu* resemble the *Dinornis* in this respect. The body of the third sacral vertebra is carinate below in the Bustard, and none of the vertebræ abut by their transverse processes against the anterior part of the acetabulum.

The present pelvis of the *Dinornis*, when compared with the portions of the larger pelvis, Nos. 1558 to 1560, presents so many differences besides those of size, as to leave no doubt about the specific distinction of the birds to which they belonged.

The first sacral vertebra in the smaller pelvis has a narrower and deeper body, and there is not the deep excavation on the anterior part of the upper transverse process. The sacral ribs, as well as their ankylosed analogues, the transverse processes which succeed them, come off higher up than in the large pelvis. The lower border of the ilium is thin, and does not form a broad convex surface, increasing the width of the pelvis anterior to the acetabulum, as in the large *Dinornis*: the four inter-acetabular vertebræ without inferior transverse processes are carinate along their under surface, not flattened as in the great *Dinornis*. The upper facet of the posterior part of the ilium is more horizontal, and forms a right angle with the vertical facet: this is also divided from the anterior concave wall of the ilium, as in the Ostrich, by an angle formed by an obsolete ridge: the articular prominence behind the acetabulum is relatively longer in the axis of the pelvis, but less deep in the smaller species. The root of the ischium where it forms the upper part of the obturator notch is concave, and an angular process descends towards the pubis, forming a well-marked posterior boundary to the notch. In this character the smaller pelvis more resembles the pelvis of the *Emeu* than does that of the larger one; but the ischial process does not quite reach, as in the *Emeu*, the pubic bone. The ischium resembles, in its gradual

expansion and straight direction, that of the larger species, and the more perfect condition of the smaller pelvis proves that the extremity of this bone projects freely backwards, as in the *Apteryx* and *Emeu*.

1562. A mutilated pelvis of a smaller species of *Dinornis*, probably *Dinornis didiformis*, Owen. It is less entire than the preceding specimen, but manifests characters which prove it to belong to a distinct species of *Dinornis*, and apparently to an older bird, since the second sacral rib on the left side is ankylosed to the vertebral interspace. This ankylosis sufficiently demonstrates that the present pelvis is not of a younger bird than the preceding pelvis, No. 1561; and, besides the difference of size, there are the following differences of configuration:—In the present pelvis the second and third sacral ribs arise nearer the lower surface of the bodies of the vertebræ, a character by which it approximates the largest pelvis, No. 1558, from which it differs in having the bodies of these vertebræ relatively less broad and flat. The extent occupied by the four posterior orifices forming the interspaces of the lower transverse processes of the third to the seventh sacral vertebræ inclusive, is three lines greater in the present pelvis than in the one next in the order of size, No. 1561. The bodies of the four vertebræ without lower transverse processes are flatter below in the present than in No. 1561. The vacuity at the sides of these vertebræ, into which the posterior aperture of the acetabulum opens, is relatively much smaller in the present than in No. 1561; but the two transverse processes of the twelfth and thirteenth vertebræ which abut against the posterior part of the acetabulum are absolutely much thicker in the present specimen. Such differences are not manifested in the pelvis of individuals of the same species in other birds: they are associated in the present instances with minor differences in the shape of the acetabulum, especially of its posterior and inferior border, and in the relative breadth of the bodies of the posterior sacral vertebræ; the latter, however, might be a sexual difference. Seventeen of the sacral vertebræ are preserved in the present specimen, and the expanded spinous plate of the posterior ones is more perfectly preserved than in the preceding pelvis, No. 1561.

1563. The left moiety of a pelvis, bisected vertically and lengthwise, of apparently the same species of *Dinornis* as the foregoing specimen. It differs in the minor elevation of the spines of the seven anterior sacral vertebræ and of the co-ascending plates of the iliac bones, and in the greater breadth of the pelvis behind the acetabulum; but these may be sexual distinctions, as the correspondence in size, characters of maturity and other particulars is almost complete. The cut surface exposes the dilated cavity of the sacral enlargement of the spinal chord, and shows the internal orifices of the separate canals of the motor and sensitive roots of the spinal nerves. The remains of the lofty spines of the several anchylosed sacral vertebræ exhibit their conversion, as it were, by extreme antero-posterior compression, into transverse plates, slightly radiating as they ascend, and connecting like tie-beams the iliac plates with each other and with the sacrum: their interspaces are occupied by a loose cancellous texture. The thin neural arch is expanded vertically and transversely at the interspaces of the origins of the spinal laminae, and gives an undulating form to the roof of the spinal canal.

Presented by William Cotton, Esq., F.R.S.

1563¹. A corresponding section of the pelvis of a young Emu (*Dromaius ater*), showing a smaller proportional expansion of the spinal canal for the enlargement of the chord whence the nerves of the legs originate, and the more marked difference in the form and proportions of the iliac plates, especially behind the acetabulum.

Presented by Prof. Owen.

1564. The shaft of the right femur of the *Dinornis giganteus**.

1565. A model of the entire femur of the *Dinornis giganteus*, restored according to the proportions of the foregoing diaphysis, and the characters of the perfect femur, No. 1568.

1566. The left tibia of the *Dinornis giganteus*: it measures two feet eleven inches in length and six inches and a half in circumference at the middle of the shaft.

* See the description of this part in the Transactions of the Zoological Society, vol. iii. p. 29. pl. 3.

The chief generic characters of the tibia of the *Dinornis* are, the broad and wide concavity anterior to the proximal articular surface, the great breadth of the ascending wall of bone for the implantation of the rotular or extensor tendon, and, at the distal end, the slight anterior production of the lateral ridges of the trochlea. All these characters are very strikingly distinctive when the tibia of the *Dinornis* is compared with that of the Ostrich; the difference is less, though well-marked, in relation to the Emeu or Apteryx. The tibia of the *Dinornis* differs from that of all known existing Struthious birds in the presence of the canal above the distal trochlea on the anterior and inner side of the bone, formed by the oblique osseous bridge across the extensor tendon. The affinity of the *Dinornis* to the Bustard and other *Grallæ*, and to the *Gallinæ*, is indicated by this structure. The inner condyle or division of the distal trochlea is relatively more produced backwards than in the *Struthionidæ* and *Grallæ* generally. The anterior crista at the head of the bone is less developed than usual. The longitudinal ridge for the fibula on the proximal half of the bone is well-marked; but the fibula has not been anchylosed to it. The orifice of the canal for the medullary artery is close to the termination of the fibular ridge. Notwithstanding the great length of this tibia, it is relatively thicker than in the Ostrich and other known long-legged birds.

1567. The left tarso-metatarsal bone of the *Dinornis giganteus*, apparently of the same individual bird as the preceding specimen. It measures eighteen inches and a half in length, five inches and a half in circumference at the middle of the shaft, and five inches in breadth across the distal end. The tarso-metatarsal bone of the *Dinornis* consists of the tarsal and of three primitively distinct metatarsals blended together, and forming, as usual, a single bone, divided at the distal extremity into three trochlear articulations, for the three toes. The proximal articulation presents two concavities, the inner one the deepest, and the dividing ridge is slightly produced upwards at its anterior termination into a conical obtuse process. The margins of the proximal end of the present bone have been broken and worn away, but enough remains to show, that as in Nos. 1574 and 1585, there are two short and thick longitudinal ridges at the

back part of this end of the bone, divided by a deep round groove for the flexor tendon of the toes : the ridges are supported by a thick longitudinal eminence, which is continued down the middle of the back part of the bone, gradually subsiding as it descends. On each side of the upper part of this median longitudinal eminence there is a foramen, as in most other birds, from which a shallow and narrow longitudinal canal is continued for some distance down the bone : there are no other canals, nor any longitudinal angular ridges at the back part of the metatarsus ; nor is there the slightest trace of a surface for the attachment of a hind-toe. On the anterior part of the bone, near the proximal end, there is the usual depression, in which the canals continued from the two posterior foramina terminate by a single foramen : below the depression there is a rough surface for the insertion of the tendon of the *tibialis anticus*, from which point a median wide and shallow channel extends a certain way down, and divides into two shallower depressions, which diverge to the interspaces of the distal articular condyles : the margins of all these depressions are rounded off, and the general surface of the anterior, as of the posterior part of the metatarsus, is smooth and rounded : this, with the great breadth of the bone as compared with the metatarsi of other *Struthionidæ* and tridactyle *Grallæ*, constitutes the principal generic character of the tarso-metatarsal bone in the Dinornis. The interspaces of the three articular terminations are wider, the two lateral ones diverging more, and being of larger size than usual ; they have also the median trochlear groove, but not so deep as in the middle articular process.

The length of the tarso-metatarsal bone in the gigantic Dinornis is a trifle more than half that of the tibia. In the tridactyle Emeu the tarso-metatarsal bone is as long as the tibia ; in the Ostrich and the Bustard it is a little shorter than the tibia. The still shorter proportion which it bears to the tibia in the Apteryx of New Zealand forms a striking resemblance between this bird and the Dinornis. But the Apteryx is distinguished from the larger *Struthionidæ* not more by its elongated slender bill than by the presence of a fourth small toe on the inner and back part of the foot, articulated to a slightly raised rough surface of the

tarso-metatarsal, about a fourth of the length of that bone from its trifold distal end: the Dodo was also tetradactyle, like the Apteryx. Thus the tarso-metatarsal bone of the *Dinornis* distinguishes that bird generically by its structure from the two last-named *Struthionidæ*, as it does by its shorter and stouter proportions from the Cassowary, the Emeu and the Rhea: the three well-developed anterior toes more obviously distinguish the *Dinornis* from the didactyle Ostrich.

1568. The metatarsal bone of a young *Dinornis giganteus*. The condition of this bone, or rather group of bones, demonstrates, what could not indeed be reasonably doubted, that a more tardy ossification coexists in the *Dinornis*, as in other *Struthionidæ*, with the absence of the powers of flight. The marks of immaturity in the present specimen are the gradual deepening and widening of the anterior median channel of the shaft as it approaches the proximal end of the bone, until it divides into the fissures separating the proximal ends of the three constituent metatarsals, which extremities in the specimen are broken off immediately above the point where they begin to coalesce.
- 1568'. The partially anchylosed metatarsus of a half-grown Ostrich: in this, which is rather more than two-thirds the length of the same bone in the mature bird, the tarsal bone, which seems to represent a proximal epiphysis, is detached, and the posterior channel of the metatarsus deepens and widens as it approaches the proximal extremity, and is finally lost in the two deep and narrow clefts which divide the proximal ends of the three constituent metatarsals from each other.

Presented by Prof. Owen.

1569. The right femur of the *Dinornis ingens*, Owen. It measures thirteen inches in length and six inches in circumference at the middle of the shaft.

The femur in this, as in other species of the genus *Dinornis*, is remarkable for its great strength and the expansion of its extremities. The trochanter is unusually broad, thick and elevated; the distal extremity is still more remarkable for its great size, and especially for the breadth of its rotular concavity. The shaft is rounded, not compressed and subtriangular.

as in the Ostrich : in no bird are the muscular ridges and tuberosities so strongly developed on the posterior part of the shaft : the orifice of the medullary artery is at the middle of this surface. The popliteal space is deeply excavated. There is a rough deep oval depression at the upper and back part of the outer condyle.

1570. A cast of the left tibia of the *Dinornis ingens*. It measures two feet five inches in length, and five inches and a quarter in circumference at the middle. It presents a closer correspondence in its proportions and configuration with the tibia of the *Dinornis giganteus*, No. 1566, than with that of the smaller species *Dinornis didiformis* and *Dinornis otidiformis*. It presents all the characters of the bone of a mature or old bird : the external ridge at the proximal extremity is relatively less produced, but it is thicker and stronger than in No. 1566 : the difference of size appears too great to depend on a sexual variety in this respect. The femur No. 1569 bears the same proportions to the present tibia which the shaft of the femur No. 1564 does to the tibia No. 1566.

The original of this cast is in the Geological Museum at Oxford.

Presented by the Rev. Dr. Buckland, F.R.S.

1571. The left femur of the *Dinornis struthoides*, Owen. This bone measures eleven inches in length and five inches and a half in circumference at the middle of the shaft. Like the femur No. 1569, the parietes at the back part of the proximal end of the bone are entire and imperforate as in the Apteryx, and the weight of the bone accords with this evidence of the absence of the air-cells which penetrate the medullary cavity in the Ostrich, Cassowary, Rhea and Emeu.
1572. The shaft of the right femur of apparently the same individual *Dinornis struthoides*.
1573. The shaft of the left femur of a younger individual of the *Dinornis struthoides*. This femur corresponds with the femur No. 1571 in its general form, its ridges and tuberosities ; but these are less strongly developed, and the manner and extent of abrasion of both proximal and distal articular surfaces well accord with the supposition of their having been in

that cartilaginous or less completely ossified state which characterizes the femur of a bird not quite fully arrived at maturity. The state of development of the muscular ridges and tuberosities forbids the reference of this femur to a very young bird, but supports the conclusion that the bone had belonged to an individual as far advanced in growth as is indicated by the difference in size between it and the femur No. 1571.

1574. The left tarso-metatarsal bone of the *Dinornis struthoides*. It measures one foot in length, four inches and a quarter in circumference at the middle of the shaft, and four inches across the distal end. Besides the difference of proportions between the present bone and No. 1567 which is indicated by these admeasurements, the anterior longitudinal concavity, commencing below the rough depression, is deeper; the channel leading to the cleft between the condyles for the outer and middle toes is also relatively narrower and deeper; the posterior commencement of the middle condyle projects further and more abruptly in the present bone than in No. 1567; the posterior part of the distal half of the bone is more convex. These differences, taken in connection with the greater breadth and thickness of the bone, in proportion to its length, confirm the conclusions of specific distinction deducible from those proportions.
1575. The left femur of the *Dinornis dromioides*, Owen. This bone is of equal length with No. 1573, but is not so thick. The shape of the shaft of the bone is also different: the relative antero-posterior diameter of No. 1573 is much greater than that of the present bone, especially at the proximal end and trochanterial enlargement of the shaft, and just above the inner condyle: the anterior surface of the proximal part of the shaft presents a shallow equable concavity in No. 1575 which is not present in No. 1573. In No. 1575 a pretty sharp ridge leads from the middle of the posterior surface of the shaft obliquely to the upper and posterior angle of the inner condyle, and the posterior surface of the expanded shaft above the condyles is regularly excavated by a moderate concavity which is continued uninterruptedly into the inter-condyloid depression. In No. 1573 an oblong rough tuberosity, with its long axis parallel with that of the bone,

exists in the place where we find the oblique ridge in the other bone, the tuberosity being separated from the upper and posterior angle of the inner condyle by a smooth channel or depression, which leads to an oval depression much deeper and more circumscribed than is the corresponding concavity in the present femur. The complete development of the muscular ridges and tuberosities, and the better preserved state of the articular extremities, show this femur to be a more mature bone than No. 1573 ; the differences in proportion and configuration prove it to belong to a distinct species from *Dinornis struthoides*.

1576. The shaft of the left femur of a younger individual of the *Dinornis dromioides*.
1577. The right femur of the *Dinornis didiformis*, Owen.
1578. The left femur of the *Dinornis didiformis*. This bone is eight inches in length, four inches and a quarter in circumference at the middle of the shaft, and three inches and a half in breadth across the distal end : the right femur, No. 1577, presents the same dimensions, but is two lines narrower at the distal end.

With respect to these small femora, if they had belonged to young birds of the larger species, their nonage would unquestionably have been indicated by the characters of the bones. The femur of a young Ostrich, bearing the same proportion to that of the adult which No. 1577 bears to No. 1569, has the whole upper surface of the proximal end and all the distal articulation covered with thick cartilage, and the line of the terminal epiphysis is conspicuous, although the uniting ossification has commenced ; the trochanterian ridge is rounded off ; the surface of the shaft of the bone is smooth ; the muscular ridges quite undeveloped. In the small femora of the *Dinornis*, Nos. 1577 and 1578, no trace of the separation of the terminal epiphyses remains ; the sculpturing of the articular surfaces is sharp and bold ; every ridge and tuberosity indicative of muscular action is as strongly developed as in the largest femora.

In comparison with the femur of the *Dinornis dromioides*, No. 1575, the present bone, No. 1578, which is one inch and five lines shorter, has

very nearly an equal circumference of the middle of the shaft, and a quite equal breadth of the distal end, the antero-posterior diameter of the condyles being also the same in both. If the comparison of these two femora be pursued into further details, it is seen that the anterior margin of the great trochanter is more produced but narrower in No. 1575 than in No. 1578, that the anterior surface of the shaft is more convex, and that the anterior curve of the outer condyle is shorter in the longer femur, No. 1575: the antero-posterior diameter of the great trochanter and of the shaft, especially of that part leading to the outer condyle, is less in the longer femur. With regard to the configuration of the popliteal space, the same differences exist between the femur of the *Dinornis dromioides* and that of the *Din. didiformis*, as have been already pointed out between the femur of the *Dinornis dromioides* and that of the *Din. struthoides*, viz. a circumscribed tuberosity in place of a continuous ridge in the present femur, and a deeper and smaller instead of a shallower and larger concavity.

1579. The half of a longitudinally bisected femur of the *Dinornis didiformis*. A small portion of the parietes at the posterior part of the proximal end of the shaft has been broken away, which exposes a few shallow cancelli but no canal leading to the cavity of the shaft: this is a true medullary cavity, remarkable for the great thickness of its compact parietes. A few oblique laminæ break the continuity of the smooth, imperforate, inner surface of the medullary cavity; they become more numerous towards the two extremities of the bone, which are principally occupied by a coarse cancellous structure.

1579¹. The half of a longitudinally bisected femur of a young Emeu of corresponding size with the preceding specimen. It shows the air-canal continued from the wide aperture at the back part of the neck of the femur into the cavity of the shaft; the thin compact walls of that cavity; the delicate bony lamellæ forming the inner wall of the air cavity and reduced in a great part of its extent by the numerous perforations to the state of lace-work.

Presented by Professor Owen.

1580. A transverse section of the half of a longitudinally bisected femur of the

Dinornis didiformis; showing the great thickness of the compact walls at the middle of the shaft.

1581. The right tibia of the *Dinornis didiformis*.

1582. The half of the shaft of the right tibia, longitudinally bisected, of the *Dinornis didiformis*.

1583. The left tibia of the *Dinornis didiformis*.

1584. A portion of the shaft of the left tibia of the *Dinornis didiformis*.

The length of the tibia No. 1581 is fifteen inches and a half, that of the tibia No. 1583 is sixteen inches and a quarter; the circumference at the middle of the shaft is four inches in the first, and four inches one line in the second: they both clearly belong to the same species and manifest the same proportions to the femora Nos. 1577 and 1578, as the tibia No. 1570 does to the femur No. 1569. The tibia of the *Dinornis didiformis* is thicker in proportion to its length, has relatively broader proximal and distal extremities, and a longer ridge for the attachment of the fibula, than that of the *Dinornis giganteus* or *Din. ingens*.

The anterior ridge at the proximal end of the bone is nearer the middle in *Din. didiformis*, the interspace between that and the external ridge being of the same breadth in the tibiæ of the small and large species, notwithstanding the difference of total breadth. The external proximal ridge curves more abruptly outwards from the shaft of the bone in the small than in the large tibiæ, whereas the contrary character ought to have been manifested if the difference of size had depended on difference of age, such muscular ridges being more strongly produced in old than in young birds. The shaft of the bone is flatter antero-posteriorly, compared with its breadth, in the small than in the large tibia, and is more nearly trihedral, owing to the greater flatness of the inner and anterior surface and the less rounding off of the inner margin.

1585. The left tarso-metatarsal bone of the *Dinornis didiformis*. This bone measures six inches ten lines in length, three inches three lines in circumference at the middle of the shaft, and three inches in breadth across the distal end. If these dimensions be compared with those of

the larger tarso-metatarsal bones Nos. 1567 and 1574, it will be found that whilst the circumference of the middle of the shaft in No. 1567 is less than one-third of the entire length of the bone, and that of No. 1574 is rather more than one-third, that of the present small metatarsal is a little more than one-half. Again, the breadth of the distal end of the present metatarsal is nearly one-half the length of the bone ; in No. 1574 it is just one-third ; in No. 1567 it is two-sevenths. The difference is well-marked in the proportions of the breadth or lateral diameter of the shaft as compared with the thickness or antero-posterior diameter, but is less between No. 1567 and No. 1574 than between either of these and the present bone. This small metatarsal also presents differences of configuration when compared with the larger metatarsals, besides those indicated by the admeasurements, which assist in establishing a distinction of species : the distal end of the bone is more suddenly expanded than in the larger specimens ; the proximal posterior prominence of the middle division of the metatarsal more rapidly subsides as it descends ; there is no longitudinal channel continued downwards from the hole on the inside of this prominence, such channel being as well marked in the larger metatarsals as the outer one : the shallow concavity on the outside of the prominence is relatively broader in the smaller metatarsal. The inner concavity of the proximal articular surface is relatively deeper in the present bone. The median longitudinal concavity, below the rough depression at the anterior part of the proximal end of the bone, is hardly discernible in No. 1585, but is well marked in Nos. 1567 and 1574. Finally, the small metatarsal, which is but half the length of No. 1574, and but one-third the length of No. 1567, has all the characters of the compound tarso-metatarsal in a fully mature bird. There is no trace of the original separation of the proximal epiphysis ; and, with respect to that of the three primitive constituents of the shaft of the bone, it is as obscurely indicated as in other old tridactyle birds, by the two small holes at the back and upper part of the bone. I have inferred, therefore, from the present small metatarsal, the former existence of a distinct species of three-toed Struthious bird, differing from the larger species of *Dinornis* in its relatively shorter and broader metatarsus. In this character the present species of

Dinornis closely resembled the extinct Dodo (*Didus ineptus*, Linn.) of the Isles of France and Rodriguez; and as it could not have greatly surpassed them in size, it has been proposed to designate it *Dinornis didiformis*.

Like the larger species of Dinornis, there is not the slightest trace of the articulation of a fourth or posterior toe in the metatarsal of the *Dinornis didiformis*; the generic distinction from *Didus* and *Apteryx* being thus distinctly indicated in all the tarso-metatarsal bones of the present collection.

If the different proportions and configurations of the present small tarso-metatarsal bone justify the conclusion that it belonged to a particular species of Dinornis, by parity of reasoning the same inference must be drawn in regard to the intermediate-sized tarso-metatarsal No. 1574, which is far from repeating the proportions of the largest bone, No. 1567, as the dimensions already given demonstrate. No. 1585 is in fact a more robust bone, in proportion to its length; the anterior longitudinal concavity, commencing below the rough depression, is deeper; the channel leading to the cleft between the condyles for the outer and middle toes is also relatively narrower and deeper; the posterior commencement of the middle condyle projects further and more abruptly in No. 1585 than in No. 1567; the posterior part of the distal half of the bone is less convex.

The physiologist contending for a difference of age merely in the birds to which the bones Nos. 1567 and 1585 belonged, must be prepared to show that in other large Struthious birds the tarso-metatarsal bones alter in their proportions as well as their size in the progress of growth, and that they are thicker and more robust in the young than in the old birds. The contrary however is the case in the Ostrich and the Common Fowl. In the great existing Struthious bird more especially, which offers the most instructive analogy in the present comparison, the tarso-metatarsal bone is relatively more slender in proportion to its length in the young bird than in the old, at least at the period of growth when the tarso-metatarsal bone has attained two-thirds its full size, which is precisely the proportion which the bone of the Dinornis No. 1574 bears in length to the bone No. 1567.

But the comparison with the bones of the young Ostrich brings to light another character, which effectually decides the question of the relation between the three different-sized bones of the *Dinornis* under consideration. In all birds, the tarso-metatarsal bone, as is well known, is an aggregate of several distinct ossicles, the primitive separation of which continues longest in those birds whose respiratory, circulating and muscular energies are least developed. Thus in the Penguins the three metatarsal bones are almost quite distinct from one another throughout life; and in the Ostrich and other *Struthionidæ* deprived of the power of flight, the primitive separation of the metatarsals continues at their extremities to nearly full growth, as is exemplified in the tarso-metatarsal bone of the young Ostrich, No. 1568. The tarso-metatarsal bone No. 1568, however, actually is what the present specimen, No. 1585, might have been mistaken for, viz. a bone of a young individual of a gigantic species of *Dinornis*, and the condition of this young bone demonstrates, what could not indeed be reasonably doubted, that a more tardy ossification coexists in the *Dinornis*, as in other *Struthionidæ*, with the absence of the powers of flight; which, therefore, as it establishes the maturity of the tarso-metatarsal bone No. 1574, proves, *à fortiori*, that the smaller tarso-metatarsal, No. 1585, with all the characters of mature age, could not have belonged to a young individual of either of the two larger species.

1586. A left metatarsal bone of the *Dinornis didiformis*, from which the posterior parietes have been removed to expose the internal structure of the bone. The line of union of the proximal or tarsal epiphysis is indicated by the dense tissue by which it has been obliterated; the coarse cancellous texture of the proximal end of the confluent metatarsals soon subsides, and a common medullary canal is exposed in the shaft of the composite bone, partially divided by two thin septa into three equal compartments, indicative of the three primitively distinct metatarsals: the medullary cavity terminates below by dividing into brief continuations entering the commencement of the divisions for the support of the three toes.

The dimensions of this bone correspond with those of the preceding.

1587. The shaft of a left metatarsal bone of corresponding dimensions with the preceding ; a section has been removed from the proximal end, showing the confluence of the originally distinct juxtaposed walls of the three metatarsals, and the coarse cancellous structure in the centre of each.
1588. The left tarso-metatarsal bone of the *Dinornis didiformis* : this specimen measures seven inches ten lines in length ; it is in other respects identical in character with the preceding bones Nos. 1585, 1586, and appears to indicate a sexual superiority of size.

Presented by William Cotton, Esq., F.R.S.

1589. A phalanx, apparently the second of the middle toe, of the *Dinornis struthoides* : it is three inches and a half long and one inch and a half broad across the proximal joint. This does not present the median vertical ridge which the corresponding groove in the articular surface of the metatarsal indicates the proximal phalanx to possess, and it appears therefore to be a second phalanx, which, as in the middle toe of the Ostrich, would then differ from the first phalanx in the equable concavity of the proximal articular surface. In the second or outer toe of the Ostrich the median eminence is wanting on the proximal end of the first phalanx, but the want of symmetry in that bone shows that it cannot be the analogue of the phalanx of the *Dinornis* in question, which is almost quite symmetrical. From this character it may be referred to the middle toe : compared with the second phalanx of that toe in a full-grown Ostrich, it is relatively longer, less depressed or flattened, the depth of the bone being equal to its breadth except at the distal articulation, which nevertheless is much less expanded and depressed than in the Ostrich. In this bird the length of the second phalanx of the middle toe is two inches and a quarter, the breadth of the distal end is one inch and a half, and its depth at the middle of the bone eight lines. In the phalanx of the *Dinornis* the breadth of the distal end is one inch and a quarter, its depth at the middle ten lines. The size of the phalanx of the *Dinornis*, regarded as the second of the middle toe, agrees well with that of the tarso-metatarsal of the *Dinornis struthoides*.

1590. A smaller phalanx, apparently a proximal one of an outer toe. It presents an unsymmetrical figure, and its proximal articular concavity is continuous with an oblique notch which divides the lower border into two tuberosities. This structure is slightly indicated at the corresponding part of the proximal phalanx of the outer toe in the Ostrich, and in the Bustard is as strongly marked in the proximal phalanx of both the outer and inner of the three toes as in the phalanx of the *Dinornis*. This phalanx measures one inch ten lines in length, one inch two lines across the proximal end, and ten lines across the distal end: the articular surface here is impressed by a vertical groove, as in the proximal phalanges of the outer and inner toes in the Bustard, and it agrees in its general figure with that of the outer toe of the left foot, but is much thicker in proportion to its length. The proximal articulation matches in size with, but is not adapted by its configuration to, the outer trochlea of the trifold metatarsal of the *Dinornis didiformis*.
1591. The shaft of the right femur of the *Dinornis otidiformis*. It measures two inches one line in circumference at the middle of the shaft.
1592. The right tibia of the *Dinornis otidiformis*. It measures eight inches nine lines in length, and one inch eleven lines in circumference at the middle of the shaft. This bone, notwithstanding the disparity of size between it and the tibia of the *Dinornis giganteus*, presents the characters of full maturity; the ridge for the fibula and those at the proximal end of the bone being quite as strongly developed. In the tibia of a half-grown Ostrich, the antero-external ridge, which in the adult projects strongly from the head of the bone, is in the state of cartilage, the fibular ridge undeveloped, and both articular extremities in a state of epiphysis and incompletely ossified: the same conditions which influence, as has been already remarked, the tardy ossification in the Ostrich must have been still more operative in the *Dinornis*, in which the absence of air in the femur indicates as low a development of the respiratory system as in the Apteryx. If this reasoning be admitted to establish the maturity of the tibiæ of the *Dinornis ingens* and *Dinornis didiformis*, it equally proves that of the present tibia, which bears the same

proportion to the bone of sixteen inches in length, as this does to that of thirty-five inches. The tibia of eight inches and two-thirds in length has its articular extremities as completely ossified and confluent with the shaft, and its proximal and fibular ridges as strongly developed, as in the larger tibiæ.

The shape of its proximal articulation differs more from that of No. 1583 than this does from that of No. 1570; the tibial half is broader from behind forwards than transversely; the anterior ridge at the proximal end is nearer the middle of the bone than in No. 1583, *à fortiori*, nearer than in No. 1570; the inner side of the bone is more rounded or less angular, especially at the proximal half of the shaft; the transverse diameter of the shaft is proportionally less than the antero-posterior one; the posterior notch between the distal condyles is deeper, and the inner condyle is more compressed laterally, and is produced further backwards.

There is no tarso-metatarsal to match the present tibia, but it unequivocally establishes a species of cursorial bird, which, from the agreement of the bone in its general characters with the tibiæ of the larger species, most probably belonged to the same genus, *Dinornis*, but did not surpass in size the Great Bustard (*Otis tarda*). I have therefore named the species to which it belonged *Dinornis otidiformis*.

1593. A series of plaster-casts or models of the bones of the *Dinornis giganteus*, articulated according to their natural connections and relations in the living bird, so as to show the height of the hind-legs and pelvis, whereby the total altitude of the bird may be conceived and approximatively determined by the analogies of the existing *Struthionidæ*. In these the neck varies slightly in its relative length, being longest in the Ostrich and Emeu, in which it includes eighteen or nineteen vertebræ, and shortest in the Cassowary and Apteryx, which have respectively sixteen and fifteen cervical vertebræ; but in all the species it is of sufficient length to enable them readily to pick up substances from the ground by a slight rotation or bending down of the trunk and pelvis upon the hip-joints. The tibia of the *Dinornis giganteus*, with its extremities entire, measures two feet eleven inches: this bone, articulated with a femur of sixteen inches and a tarso-metatarsal bone of eighteen inches in length, at angles corre-

sponding to those in the Ostrich, and with an allowance of three inches for the natural angle of the toes and the callous integuments beneath the distal joint of the metatarsal bone, makes the height of the hind-leg to the highest point of the femur five feet six inches : from the level of this point to the top of the head, supported upon an erect neck of the same proportions as in the Ostrich, would be five feet, making the total height of the *Dinornis giganteus* ten feet six inches. If the tarso-metatarsal bone of the Dinornis had borne the same proportion to the tibia as in the Ostrich, its height would have been nearly twelve feet, but the acquisition of the tarso-metatarsal belonging to the largest tibia fortunately prevented this error of exaggeration.

But since the Cassowary and Apteryx, as compared with the Ostrich and Emeu, combine shorter tarso-metatarsals with their shorter necks, the Dinornis is more likely to have resembled these birds than the Ostrich in the proportionate length of its neck, and we know that it resembled the Apteryx much more than the Ostrich in the robust proportions of the cervical vertebræ. In the Apteryx, however, the peculiar length of the bill compensates for the relative shortness of the neck ; and until we have proof to the contrary, we must suppose the Dinornis to have had a bill of the ordinary proportions which it presents in the large existing *Struthionidæ* : the Cassowary seems, therefore, to offer the best term of comparison by which to calculate the height of the Dinornis. In the skeleton of a full-grown Cassowary the tarso-metatarsal bone measures eleven inches in length : allowing an inch for the callous integuments beneath its distal articulation, the tibia and femur, articulated at the angles natural in the standing posture, rise to the height of two feet nine inches. From the level of the top of the trochanter to the top of the cranial crest is two feet three inches, and to the base of the crest two feet. We have evidence in No. 1552 that the Dinornis did not possess that peculiar defence upon the head, and therefore, from the ground to the summit of the trochanter of the *Dinornis giganteus* being five feet six inches, from this level to the top of the head, according to the proportion of the uncrested Cassowary, would be four feet, making the total altitude nine feet six inches. Thus, if we take the average of the

altitudes of the *Dinornis giganteus*, as given by the analogies of the existing *Struthionidæ*, we are compelled to restrict our ideas of its height in the ordinary upright posture to ten feet.

The *Dinornis struthoides*, with a femur of eleven inches, a tibia of twenty-two inches, and a tarso-metatarsus of twelve inches in length, must have stood, according to the analogies of the Cassowary, six feet nine inches in height ; according to those of the Ostrich, seven feet four inches : we may therefore regard its height to have not exceeded seven feet, or to have been about equal to that of a moderate-sized Ostrich, but of a more robust and stronger build. The fragment of the femur first described by me in 1839 belongs to this species.

The *Dinornis didiformis*, with a tibia as long as that of the Cassowary, viz. sixteen inches, but with a femur of eight inches and a tarso-metatarsus of only seven inches in length, would, by the analogy of the Cassowary, be a little under four feet in height, or of intermediate size between the Cassowary and the Dodo.

The femur of nine inches in length, with similar proportions of the tibia and metatarsus, which latter would probably be relatively longer, gives the height of five feet to the species which, from the similarity of its size to the Emeu (*Dromaius ater*), I have called *Dinornis dromioides*.

The following letter from the Rev. William Williams to the Rev. Dr. Buckland, relates to the bones of the *Dinornis* described above.

“ Dear Sir,

“ Poverty Bay, New Zealand, Feb. 28th, 1842.

“ It is about three years ago, on paying a visit to this coast, south of the East Cape, that the natives told me of some extraordinary monster which they said was in existence in an inaccessible cavern on the side of a hill near the river Wairoa ; and they showed me at the same time some fragments of bone taken out of the beds of rivers, which they said belonged to this creature, to which they gave the name of ‘ Moa.’ When I came to reside in this neighbourhood I heard the same story a little enlarged, for it was said that the creature was still existing at the said hill, of which the name is ‘ Wakapunake,’

and that it is guarded by a reptile of the Lizard species, but I could not learn that any of the present generation had seen it. I still considered the whole as an idle fable, but offered a large reward to any one who would catch me the bird or its protector. At length a bone was brought from a river running at the foot of the hill, of large size, but the extremities were so much worn away that I could not determine anything as to its proper relationship. About two months ago a single bone of smaller size was brought from a freshwater stream in this bay, for which I gave a good payment, and this induced the natives to go in large numbers to turn up the mud at the banks and in the bed of the same river, and soon a large number of bones was brought, of various dimensions. On a comparison with the bones of a fowl, I immediately perceived that they belonged to a bird of a gigantic size. The bones of which the greatest number have been brought are the three bones of the leg, a few toe-bones, and one claw, which is one inch and a half in length, a few imperfect pelves, and a few vertebræ of different dimensions, and one imperfect cranium, which is small. There are also a few broken pieces, which seem to be ribs. In the case now sent you will receive the largest specimens I have obtained, and also a few of smaller size. The length of the large bone of the leg is two feet ten inches. I have a second case, which I shall send by another vessel, to make sure of your receiving them. If the bones are found to be of sufficient interest, I leave it to your judgement to make what use of them you think proper; but if the duplicates reach you, perhaps one set may with propriety be deposited in our museum at Oxford.

“ The following observations may not be devoid of interest:—

“ 1st. None of these bones have been found on dry land, but are all of them from the bed and banks of freshwater rivers, buried only a little distance in the mud; the largest number are from a small stream in Poverty Bay, Wairoa, and at many inconsiderable streams, and all these streams are in immediate connexion with hills of some altitude.

“ 2nd. This bird was in existence here at no very distant time, though not in the memory of any of the inhabitants, for the bones

are found in the beds of the present streams, and do not appear to have been brought into their present situation by the action of any sudden rush of waters.

“ 3rd. They existed in considerable numbers. I have received perfect and imperfect bones of thirty different birds.

“ 4th. It may be inferred that this bird was long-lived, and that it was many years before it attained its full size : out of a large number of bones, only one leg-bone now sent is of the size of two feet ten inches ; two others are two feet six inches, one of which I shall send hereafter. The rest are all of inconsiderable size.

“ 5th. The greatest height of the bird was probably not less than fourteen or sixteen feet. The leg-bones now sent give the height of six feet from the root of the tail. I am told that the name given by the Malays to the Peacock is the same as that given by the natives to this bird.

“ Within the last few days I have obtained a piece of information worthy of notice. Happening to speak to an American about the bones, he told me that the bird is still in existenee in the neighbourhood of Cloudy Bay, in Cook’s Straits ; he said that the natives there had mentioned to an Englishman of a whaling party that there was a bird of extraordinary size to be seen only at night on the side of a hill near there ; and that he, with the native and a second Englishman, went to the spot ; that after waiting some time they saw the creature at some little distance, which they describe as being fourteen or sixteen feet high. One of the men proposed to go nearer and shoot, but his companion was so exceedingly terrified, or perhaps both of them, that they were satisfied with looking at him, when in a little time he took the alarm and strode away up the side of the mountain. This incident might not have been worth mentioning, had it not been for the extraordinary agreement in point of size of the bird. Here are the bones, which will satisfy you that such a bird *has been*, and *there* is said to be the living bird, the supposed size of which, given by an independent witness, precisely agrees. Should I obtain anything more perfect you will not fail to hear from me, and in the meantime

may I request the favour of your opinion on these bones, and also the information whether any others of similar character have been found elsewhere?

“ I beg to remain, dear Sir, your obedient Servant,

“ WILLIAM WILLIAMS.”

“ *To the Rev. Dr. Buckland, &c. &c.*”

The remarkable geographical distribution of the birds of the Struthious order, which have no power of transporting themselves to distant isles or continents, either through the air or the ocean*, irresistibly leads us to speculate on the cause of that distribution, and its connexion with the former extent and importance of the wingless terrestrial birds. Hereupon it may first be remarked, that those species now in existence which have the least restricted powers of locomotion, enjoy the most extensive range for their exercise.

The Ostrich is spread over nearly the whole of Africa, from the Cape to the deserts of Arabia; beyond which the species is unknown. The Rhea ranges over a great part of the southern extremity of the Western hemisphere. To the Emeu has been assigned the vast mainland of Australia. The heavier Cassowary is limited to a few of the islands of the Indian Archipelago. The Dodo appears to have been confined to the Mauritius and the small adjoining Isle of Rodriguez. The Apteryx still lingers in New Zealand, where alone any specimens of that most anomalous species of the Struthious order have been discovered.

New Zealand was also, at one period, the seat of a seventh genus of *Struthionidæ*; and it is worthy of remark, that the Fauna of no other island, nor of any of the great continents, has yet furnished an analogous example of two distinct genera of that group of birds. Moreover, the most gigantic as well as the most diminutive species of the wingless group—always to Ornithologists most remarkable for the great size of

* The Rhea and Emeu have been seen to take water for the purpose of crossing rivers and narrow channels of the sea; but almost the entire body sinks below the surface, and their progress is slow, as might be anticipated from the absence of the swimming-webs in their feet. See Darwin, ‘Voyage of the Beagle,’ vol. iii. p. 105.

its species—formerly occupied their place amid the fern-brakes and turbaries of New Zealand. And, again, the number of the species of *Struthionidæ* in this island equalled that in all the rest of the world, as registered in the catalogues of Ornithology.

Now, since all the larger existing Struthious birds derive their subsistence from the vegetable kingdom, we may hope to receive from the botanist an elucidation of the circumstances which favoured the existence of so many large birds of this order in the remote and restricted locality where alone their remains have hitherto been found. It seems, at least, most natural to suppose that some peculiarity in the vegetation of New Zealand adapted that island to be the seat of apterous tridaetyla birds, so unusually numerous in species and some of them of so stupendous a size.

The predominance of plants of the Fern-tribe, and the nutritious qualities of the roots of the species most common in New Zealand, are the characteristics of its Flora which appear to have been the conditions of the former most singular Fauna of this island. Some at least of the characters of the skeleton of the *Dinornis* may well have related to rhizophagous habits. The unusual strength of the neck, the size and deep implantation of the nuchal muscles and the unusual development of the temporal muscles, indicate the application of the beak to a more laborious task than the mere plucking of seeds, fruits, or herbage. The present small *Apteryx* of New Zealand has a relatively stronger neck than any of the existing *Struthionidæ*, in relation to the needful power of perforating the earth for the worms and insects which constitute its food. Such small objects cannot be supposed to have afforded sustenance to the gigantic *Dinornithes*: but the still more robust proportions of their cervical vertebræ, and especially of their spinous processes,—so striking when contrasted with the corresponding vertebræ of the Ostrich or Emu,—may well have been the foundation of those forces by which the beak was associated with the feet in the labour of dislodging the farinaeous roots of the ferns that grow in characteristic abundance over the soil of New Zealand*.

* “New Zealand is favoured by one great natural advantage, namely, that the inhabitants can never perish from famine. The whole country abounds with fern; and the roots of this plant, if not

The great strength of the leg, and especially of the metatarsal segment, which is shortened, as in the burrowing Apteryx, almost to the gallinaceous proportions, must have had reference, especially in the less gigantic species, to something more than sustaining and transporting the superincumbent weight of the body, and this additional function is indicated by both the analogy of the Apteryx and the Rasorial birds to be the scratching up the soil.

Thus far, at least, the positive facts justify the attempt to restore, and, as it were, to present a living portrait of the long-lost *Dinornis*; and, without giving the rein to a too exuberant fancy, we may take a retrospective glance at the scene of a fair island, offering, by the will of a bountiful Providence, a well-spread table to a race of animated beings peculiarly adapted to enjoy it; and we may recall the time when the several species of *Dinornis* ranged the lords of its soil—the highest living forms upon that part of the earth. No terrestrial Mammal was there to contest this sovereignty with the feathered bipeds before the arrival of man*.

Without laying undue stress on the native tradition of the gigantic Eagle or ‘Movie,’ cited by Mr. Rule†, or on that of the great creature of the cavern, called ‘Moa,’ which first attracted the attention of Mr. Williams to the remains of the *Dinornis*; and admitting, with the cautious scepticism due to second-hand testimony, the tale of the still-existing nocturnal gigantic bird which scared the whaling seamen on the hill at Cloudy Bay,—the evidence of the chemical condition of the bones themselves‡, and their alluvial bed, favour the hypothesis of their compara-

very palatable, yet contain much nutriment.” *Voyage of the Adventure and Beagle*, vol. iii. ‘Darwin,’ p. 504.

* Mr. Darwin says, “It is a most remarkable fact that so large an island, extending over more than 700 miles in latitude, and in many parts 90 miles broad, with varied stations, a fine climate, and land of all heights from 14,000 feet downwards, with the exception of a small rat, should not possess one indigenous mammal.”—*Loc. cit.* p. 511.

† *Polytechnic Journal*, July 1843.

‡ The following chemical analyses have been made by Thomas Taylor, Esq., author of the *Catalogue of the Calculi and other Animal Concretions in the Museum of the College*:—

tively recent date. It is not altogether improbable that the species of *Dinornis* were in existence when the Polynesian colony first set foot on the island; and, if so, such bulky and probably stupid birds, at first without the instinct and always without adequate means of escape and defence, would soon fall a prey to the progenitors of the present natives.

In the absence of any other large wild animals, the whole art and practice of the chase must have been concentrated on these unhappy cursorial birds*. The gigantic *Dinornis*, we may readily suppose, would be the first to be exterminated: the strength of its kick would less avail, than its great bulk would prejudice its safety by making its concealment difficult; at all events, the most recent-looking bones are those of the smaller species. The closely allied, but comparatively diminutive *Apteryx* still survives by virtue of its nocturnal habits and subterraneous hiding-place, but in fearfully diminished and rapidly diminishing numbers. When the source of animal food from terrestrial species was reduced by the total extirpation of the genus *Dinornis* to this low point, then may have arisen those cannibal practices which, until lately, formed the opprobrium of a race of men in all other respects much superior to the Papuan Aborigines of the neighbouring continent of Australia, and

<i>Recent Tibia of Ostrich.</i>	<i>Fossil Femur of Dinornis didiformis.</i>
Animal matter.....	Animal matter.....
Phosphate of lime	Phosphate of lime with phosphate of } 66·19
Phosphate of magnesia	magnesia }
Carbonate of lime	Carbonate of lime
Sulphate and carbonate of soda, with } 0·12	Peroxide of iron
trace of muriate	Alumina
Sulphate of lime, a trace.	Sulphate, carbonate, and muriate of soda 0·32
Fluorine, a trace.	Sulphate of lime, a trace.
	Fluorine, a very distinct trace.
99·49	100·04”

The superabundance of animal matter in the bone of the extinct bird depends upon its being a marrow-bone, whilst that of the Ostrich contains air.

* As the Maoris or aboriginal Natives prize the skin and feathers of the *Apteryx* for the manufacture of ornamental robes, it might be worth inquiry whether any of the natives preserve remains of their ancestors' dresses composed of feathers of unknown and larger species of birds. Such relics of a *Dinornis* might in this way be recovered.

very little inferior to the Polynesian natives of the most favoured islands of the Pacific.

Genus *Ornithichnites**.

The following impressions and casts of impressions of foot-prints were discovered at various depths beneath the actual surface, in quarries of laminated flag-stones, belonging to the Triassic or New Red Sandstone epoch in geology, near the banks of the river Connecticut, and have been described by Prof. Hitchcock in the 'American Journal of Science and Arts,' January 1836, by whom the series was presented to the Royal College of Surgeons.

1594. A cast of a slab with a single impression of the *Ornithichnites minimus*, Hitchcock.
1595. A slab with two impressions of the *Ornithichnites minusculus*, Hitchcock.
1596. A slab with the relief of two impressions, one twice the size of the other, of the *Ornithichnites parvulus*, Hitchcock.
1597. A slab with an impression of the *Ornithichnites gracilis*, Hitchcock.
1598. A slab with an impression of the *Ornithichnites tenuis*, Hitchcock.
1599. A slab with the relief of an impression of the *Ornithichnites crassus*, Hitchcock.
1600. A portion of the triassic slate with part of an impression of the *Ornithichnites tetradactylus*, Hitchcock.
1601. A cast of a slab with an impression of the *Ornithichnites tetradactylus*, Hitchcock.
1602. A portion of the triassic slate with parts of five impressions of the *Ornithichnites Deanii*, Hitchcock.
1603. A cast of a slab with the relief of two impressions, interfering with each other, of the *Ornithichnites Deanii*, Hitchcock.

* ὄρνις a bird, ἵχθυος a foot-print, a generic name devised by Prof. Hitchcock, in reference rather to the fossilised foot-prints than to the supposed birds by which they were made.

1604. A cast of a slab with the relief of an impression of the *Ornithichnites Deanii*, Hitchcock.
1605. A cast of a slab with the relief of an impression of the *Ornithichnites Barattii*, Hitchcock.
1606. A cast of a slab with an impression of the *Ornithichnites cuneatus*, Hitchcock.
1607. A cast of a slab with the relief of an impression of the *Ornithichnites cuneatus*, Hitchcock.
1608. A cast of a long slab with the relief of four successive foot-prints of the *Ornithichnites cuneatus*, Hitchcock.
1609. A cast of a slab with a deep impression of the *Ornithichnites diversus* var. *clarus*, Hitchcock.
1610. A cast of a slab with an impression of the *Ornithichnites diversus* var. *platydactylus*, Hitchcock.
1611. A cast of a slab with a deep impression of the *Ornithichnites diversus* var. *clarus*, Hitchcock.
1612. A cast of a large slab with four or five impressions of the *Ornithichnites diversus* var. *clarus*.
1613. A cast of a slab with an impression of the *Ornithichnites parallelus*, Hitchcock.
1614. A cast of a slab with an impression of the *Ornithichnites divaricatus*, Hitchcock.
1615. A cast of a slab with an impression of the *Ornithichnites tuberosus*, Hitchcock.
1616. A cast of a slab with an impression of the *Ornithichnites robustus*, Hitchcock.
1617. A cast of a slab with the relief of an impression of the *Ornithichnites ingens*, Hitchcock.

1618. A portion of the triassic slate with the relief of the impressions of one of the toes of the *Ornithichnites giganteus*, Hitchcock.
1619. A cast of a slab with the relief of an impression of the *Ornithichnites giganteus*, Hitchcock.
1620. A cast of a slab with the relief of an impression of the *Ornithichnites giganteus*, Hitchcock.

This is the most remarkable of the fossil footsteps of the Connecticut triassic slate ; they have as yet been found in one quarry only, at Mount Tom, near Northampton, United States ; here, four nearly parallel tracks of the gigantic Ornithichnite were found, and in one large slab six footsteps appeared in regular succession, at a distance of four feet from one another. In others the distance varied from four to six feet ; the latter was probably the longest step of this gigantic bird while running.

We are naturally led to compare these indications of large tridactyle birds of the very remote geological period, indicated by the formation in which they occur, with the actual remains of the skeleton of equally gigantic tridactyle birds, which have perished at a much more recent period in the island of New Zealand.

The epoch of the Ornithichnites is as ancient as that of the Cheirotheria or Labyrinthodont footsteps in Europe, and more ancient than those of the oolites and lias, from which the remains of our most extraordinary extinct reptiles have been obtained : but no fossil bones of birds have been found associated with the Labyrinthodont and Thecodont reptiles, nor with those of the lias or oolites, the Pterodactyles of which were once mistaken for birds. The Wealden is the oldest formation in which true ornitholites have hitherto been discovered. The ancient footprints of the Connecticut sandstones were for the most part supposed to be those of *Grallæ* ; but the high geological antiquity of those sandstones, and the interferences which might be deduced from the low character of the air-breathing animal creation, as indicated by fossil bones, of the condition of the atmosphere during the deposition of the oolites, lias and new red sandstones, induced some Palæontologists to entertain doubts, whether foot-prints alone were adequate to support the inference

that the animals that impressed them actually possessed the highly developed respiratory organization of a bird of flight. One could hardly venture, indeed, to reconstruct in imagination the stupendous bird which, on Dr. Hitecock's hypothesis, must have left the impressions called *Ornithichnites giganteus*; for before 1841, the only described relic of the extinct New Zealand bird did not warrant the supposition of a species larger than the Ostrich.

The species of *Dinornis* (*Din. struthoides*), in fact, to which that relic belonged, we now know not to have exceeded seven feet in height, which is the average stature of the Ostrich. But the bones of the *Dinornis giganteus* subsequently acquired demonstrate the existence, at a comparatively recent period, of a bird whose tridactyle foot-prints surpassed the *Ornithichnites giganteus* of Prof. Hitecock.

The length of this foot-print to the extremity of the impression of the claw of the middle toe is sixteen inches; the breadth of the back part of the impression is four inches six lines. The toes were broad and thick, and we may plainly discern that the bird supported itself, like the Ostrich, upon the under surface of the toes, from their extremities to the cushion beneath the distal end of the proximal phalanges; and that in making the impression, the foot did not quite sink as far as the end of the metatarsal bone.

The length of a corresponding impression of the foot of the Ostrich is eight inches; the breadth of the posterior part of the impression three inches; the breadth of the distal end of the tarso-metatarsal bone two inches and a half. According to these proportions, the breadth of the distal end of the tarso-metatarsal bone of the tridactyle bird that impressed the *Ornithichnites giganteus* must have been three inches nine lines; but the breadth of the distal end of the tarso-metatarsus of the *Dinornis giganteus* is five inches. According, therefore, to the proportions of the *Ornithichnites giganteus*, the breadth of the hind part of the foot-print of the *Dinornis giganteus* must have been six inches, and its length twenty-one inches and a half.

The genus *Dinornis* was characterized by a relatively broader foot than the Ostrich, as we know by the tarso-metatarsal bones; and this bone in

DESCRIPTION OF THE PLATES.

PLATE I.

A side view of the carapace and exposed parts of the internal skeleton of the Gigantic Armadillo (*Glyptodon clavipes*. See the descriptions of the specimens Nos. 524 to 541 inclusive).

The parts delineated in outline are wanting in the original specimen: the lower jaw and the tessellated helmet, or dermal bony defensive covering of the skull, are restored on the authority of an original sketch of an entire specimen of this species of *Glyptodon* transmitted to Sir Woodbine Parish from Buenos Ayres. The bones of the fore-foot are given from the figures illustrating the memoir by Professor D'Alton, published in the Transactions of the Berlin Academy for the year 1836, taf. ii. The restoration of the defective parts of the margin of the carapace is made according to the analogy of the parts preserved.

The fossil tail, which was received subsequently to the printing of the descriptions of the fossils in the present Volume, measures one foot six inches in length, is almost circular at its base, and becomes slightly depressed towards its apex; it is gently curved with the concavity upwards through its whole extent, and consists of a series of caudal vertebræ inclosed in an inflexible sheath composed of closely united dermal ossicles of various forms and sizes, but disposed in a regular and beautiful pattern. The osseous substance of the sheath increases in thickness from half an inch near its base to one inch and three quarters near its obtuse apex. The dermal ossicles are united to the internal skeleton of the tail, and defended from outward pressure by processes which radiate from the bodies of the caudal vertebræ (see Plate II. fig 4.). The dermal armour consists of central, large, or principal ossicles, and peripheral, small, or accessory pieces, the latter occupying the interspaces of most of the larger ossicles in a single series. The larger ossicles differ in size, increasing as they approach the

end of the tail, and with great regularity, where they form the two lateral series, which terminate by a pair of large, sub-elliptic, thick, hollow ossicles, which inclose the end of the tail like a bivalve shell, defending this part when dragged along the earth, and even enabling it to pierce the soil like an implement sheathed with iron (Plate II. fig. 7.). The arrangement of the ossicles in the interspaces of the two terminal lateral plates is shown in Plate II. figs. 5 and 6. The number of the lateral plates on each side of the considerable portion of the tail preserved is nine; from the first of these to the fourth the number of intermediate principal ossicles below each pair of lateral plates is six of nearly equal size; beyond this they decrease to four and three in number. At the superior interspace of the two lateral series there are six sub-equal principal ossicles between each pair of lateral plates as far as the fourth; they then decrease to five and four in number, those at the centre being of smallest size.

The circumference of the base of the tail is fourteen inches, that of the apex at the interspace of the penultimate and last lateral plates ten inches. The length of the last lateral plate is three inches and a half, its breadth is three inches.

PLATE II.

Upper and terminal views of the carapace of the *Glyptodon clavipes*.

Fig. 1. The upper view of the carapace.

Fig. 2. The front view, showing the anterior outlet.

Fig. 3. The back view, showing the posterior outlet.

Fig. 4. An anterior caudal vertebra, with part of the anterior border of the verticillate bony dermal covering or sheath of the tail. This covering was attached to the vertebra by a close syndesmosis connecting the extremities of the processes which radiated, like the spokes of a wheel, from the centrum or body: the muscular and ligamentous tissues, which occupied the interspaces (*g*) now filled by the matrix or soil-formation in which the fossil was imbedded, would also form a medium of attachment between the endo- and exo-skeletons of the tail. The length of the body of this vertebra is two inches and a half; the diameter of the articular surface of the body is one inch and a half.

- a*, The body of the vertebra.
- b*, The neural spine.
- c*, The hæmal spine, restored, in dotted outline from a consecutive vertebra : the processes on the centrum indicate the existence and strength of the bony arch for protecting the blood-vessels of the tail.
- d*, The upper transverse process continued from the neural arch.
- e*, The lower transverse process continued from the centrum.
- f*, The free anterior border of the bony covering of the tail ; it is rounded off, and from two to three lines in thickness, but gradually increases to half an inch in thickness opposite the distal end of the vertebra ; and the bony covering acquires a thickness of three-fourths of an inch towards the posterior end of the tail.

Fig. 5. The under surface of the extremity of the tail.

Fig. 6. The upper surface.

Fig. 7. The end of the tail.

PLATE III.

Views of the cranium of the *Glyptodon clavipes*.

Fig. 1. Upper surface of the cranium.

Fig. 2. Under surface of the cranium.

These views are reduced one-half the natural size.

The occipital condyle (*a*) presents a convexity in the vertical direction, which describes more than a semicircle, and is slightly convex transversely, but is narrower in that direction than it is in the *Myiodon* : it is directed in the *Glyptodon* backwards and obliquely outwards. The occipital foramen (*b*) is very large and transversely elliptical ; its plane is inclined from below upwards and backwards 20° beyond the vertical line. The anterior condyloid foramen (*c*), though large, is relatively smaller than in the *Myiodon*, and is situated close to the anterior border of the condyle. The depression for the digastric muscle (*d*) is perforated and separated from the condyle by a wider tract of the par-occipital (*e*) than in the *Myiodon*, and the petro-mastoid (*f*), below the digastric

depression, presents a rough convexity, bounded posteriorly by a transverse ridge of the par-occipital, instead of the hemispherical depression for the articulation of the stylo-hyoid bone, which characterises the skull of the *Myiodon*. The basi-occipital (*g*) presents a median smooth concavity and two lateral rough depressions which are continued on to the basi-sphenoid (*h*), and indicate the insertions of very powerful 'recti capitis antici majores': the obliterated suture between the basi-occipital and basi-sphenoid forms a rough transverse ridge: the inequalities of this part of the basal region of the skull present a striking contrast to the broad, smooth and even tract which the same part forms in the *Myiodon**. The sides of the concave under surface of the basi-sphenoid are bounded by longitudinal ridges, which have been broken off in the specimen. The petrous bone terminates by a prismatic pointed process in the foramen lacerum (*i*), which here gives passage both to the jugular vein and internal carotid. The foramen ovale (*k*) is circular, and of the same size as the anterior condyloid foramen. The foramen rotundum (*l*) is one inch and a half in advance of the foramen ovale, and opens into the commencement of a deep and long groove which traverses the base of the pterygoid processes in the direction towards the ant-orbital foramen. The base of the zygomatic process supporting the articulation of the lower jaw (*m*) is brought much nearer the occiput than in the *Myiodon*, and is separated from the petro-mastoid by a deep excavation perforated by wide apertures that seem to communicate with the tympanic cavity. The articular surface for the lower jaw is well-defined, narrow in the axis of the skull, much extended transversely, gently convex in both directions. In the skull of a recent Armadillo (*Dasypus octocinctus*), the articulation for the lower jaw is almost flat and on a level with the roof of the posterior perforated cavity: in the *Prionodon* (*Dasypus gigas*, Cuv), the articular surface is slightly concave and extends longitudinally forwards from the posterior cavity: the zygomatic process of the malar bone bounds the outer and fore part of the surface, and extends forwards in the form of a laterally compressed plate of bone, and in the *Das. sexcinctus* forms a slight angular projection below the ant-orbital perforation. In the *Glyptodon* the articulation for the lower jaw more resembles that in the ordinary *Pachyderms*, and is thus conformable with the deviation

* See Memoir on the *Myiodon*, 4to, pl. iv.

from the Edentate structure manifested by the bones of the foot. But the most remarkable characteristic of the skull of the *Glyptodon*, by which it differs from the existing Armadillos and approaches the Megatherioids, is the long and strong process (*n*) which descends from the base or origin of the zygomatic process of the maxillary bone. This process is compressed, but in the opposite direction to that in the *Mylodon*, viz. from before backwards, instead of from side to side: it measures five inches in length from the ant-orbital perforation; one inch and three-fourths in breadth across the middle: the outer margin is entire, and as if folded back; the lower half of the inner margin is slightly notched, the extremity of the process curves backwards*. Both anterior and posterior surfaces bear strong marks of the attachment of muscular fibres. The small remaining portion of the maxillary bone on the inner side of this process shows portions of three deep sockets *o, o*, of the same diameter throughout, indicating the implantation of molar teeth by a single excavated base; and showing two longitudinal ridges on both the outer and the inner side, which proves the teeth to have had the same fluted exterior which they present in the lower jaw, and of which the generic name of *Glyptodon* is expressive. The fractured anterior part of the 'basis cranii' shows the large cavities for the olfactory bulbs and the remains of a very extensive cribriform plate, the organ of smell being very largely developed.

The posterior or occipital surface of the skull slopes forward from the plane of the occipital foramen at an angle of 45° : in the small existing Armadillos it is vertical: in the *Glyptodon* it is divided by a strong median vertical ridge, and separated by a sinuous, thicker, transverse ridge from the upper surface of the skull. The posterior half of this region of the cranium is marked by the ridges bounding the origins of the temporal muscles, which almost meet along the middle or sagittal line. Part of the lambdoidal suture is seen at *p*; the other cranial sutures are obliterated. The temporal fossæ are pierced by numerous large vascular foramina. The anterior parts of the temporal ridges *q* diverge to the posterior angles of the supra-orbital ridges. The frontal or inter-orbital part of the upper surface of the cranium is broad, and nearly flat, smooth and slightly concave at its posterior half, slightly convex, rough and perforated by vascular foramina at its anterior half. The most prominent parts, above the

* The extent of this process is shown in the reduced side-view of the skull in Plate I.

orbits, are most rugose and indicate a more intimate adhesion to the superincumbent osseous dermal helmet. The lacrymal foramen *r* is pierced immediately in front of the anterior border of the orbit.

The difference in the development of the temporal muscles manifested by the Glyptodon and Mylodon, in the position of the ridges on the fossil cranium, indicates a corresponding difference in the power of mastication and in the density of the alimentary substances habitually selected by each species: the greater proportion of hard dentine in the teeth of the Glyptodon, and the greater number of the teeth, which appears to have been thirty-two, eight on each side of both jaws, coincide with the characters of the cranium and support the inferences thence deducible.

PLATE IV.

Portions of the bony armour of the different Glyptodons or extinct Gigantic Armadillos: natural size.

Fig. 1. A view of the outer surface of three ossicles taken from the anterior border of the carapace of the *Glyptodon clavipes*.

a, The median eminence, the large size of which characterizes the ossicles forming the border of the carapace, and is accompanied by a diminution of

b, The peripheral portion of the ossicle, which, at the same time, loses the marks of its subdivision into smaller eminences.

c, The median eminence of an anterior marginal ossicle, which, at this part, extends outwards and forwards in the form of a transversely, oblong, obtuse-angled prominence; the marginal part of the ossicle being almost obliterated.

d, The sutural margin of the ossicle.

Fig. 2. A view of the internal surface of the same ossicles: *d*, the suture.

Fig. 3. A side view of a hexagonal ossicle from the middle of the upper surface of the carapace of the *Glyptodon clavipes*; showing the thickness of the bony armour at that part, and the roughness of the sutural surfaces.

Fig. 4. The external surface of an ossicle from the side of the carapace, showing a variety arising from an accessory peripheral tubercle, which

forms an angular projection; the ordinary number of peripheral tubercles being seven.

Fig. 5. The external surface of a marginal ossicle from the lower border of the carapace in which the peripheral tubercles are obliterated, and the median eminence is developed into a thick pointed process.

Fig. 6. The external surface of a small portion of the bony carapace of the *Glyptodon ornatus*, showing two complete ossicles. (See No. 554.)

PLATE V.

Portions of the bony armour of different Glyptodons or extinct Gigantic Armadillos: natural size.

Fig. 1. The outer surface of a portion of the carapace of the *Glyptodon reticulatus*, in the component ossicles of which the central eminence is angular in contour and of equal size with the marginal ones, which rarely exceed six in number; the whole exterior of the carapace, except, probably, at and near its margins, being impressed by channels in the form of a net-work. (See Nos. 556 and 557.)

Fig. 2. A view of the fractured margin of two ankylosed ossicles of the same carapace, showing its thickness.

Fig. 3. A portion of the carapace, including six component ossicles, of the *Glyptodon tuberculatus*. They are square-shaped, and their outer surface is divided into more numerous elevations, separated by narrower channels, which intersect or unite with each other to form a closer network than in *Glyptodon reticulatus*: *d* is the uniting suture of the ossicles.

Fig. 4. The internal surface of the same portion of the carapace of the *Glyptodon tuberculatus*.

Fig. 5. The sutural margin of three dermal ossicles of the *Glyptodon tuberculatus*, showing the thickness of the carapace.

PLATE VI.

The molar teeth of the lower jaw of the extinct gigantic marsupial Pachyderm of Australia (*Diprotodon australis*): natural size.

Fig. 1. An ideal outline of the first molar tooth, giving its size, as indicated

by the socket in the specimen No. 1460 : the crown of this tooth may, possibly, have presented a modification of form different from the rest, and a further affinity of the *Diprotodon* to the Kangaroo may prove to be manifested by a more compressed and trenchant character of the anterior molar.

Fig. 2. Side view, *fig. 3'*, grinding surface, of the second molar tooth. (See Nos. 1491 and 1493.)

Fig. 3. Side view, *fig. 3'*, grinding surface, of the third molar tooth. (See Nos. 1492 and 1494.)

Fig. 4. Side view, *fig. 4'*, grinding surface, of the fourth molar tooth. (See No. 1495.)

Fig. 5. Side view, *fig. 5'*, grinding surface, of the crown of the fifth and last molar tooth. The fractured surface of the anterior eminence shows the thickness of the enamel. (See Nos. 1496 and 1497.) *Fig. 5''* shows the posterior surface of the second transverse eminence and the wrinkled and punctate surface of the enamel.

Fig. 6. Side view, *fig. 6'*, grinding surface, of the last lower molar tooth of the *Tapirus americanus*, showing the close similarity of the modifications of the crown of this and the extinct Australian *Diprotodon*.

Fig. 7. The grinding surface of the last lower molar tooth of a large extinct Kangaroo (*Macropus Titan*).

In the genus *Macropus* the crowns of the molar teeth support two principal transverse eminences, as in the *Tapir* and *Diprotodon*, but they are connected together by an oblique longitudinal ridge which crosses the valley, and a similar ridge connects the anterior transverse eminences with the anterior basal talon, which in the present species is unusually developed.

PLATE VII.

Views of the anterior end of the right ramus of the lower jaw of the *Diprotodon australis* (see No. 1460.) : half the natural size.

Fig. 1. Outside view : *i*, fractured base of the incisive tusk ; *m 1*, the socket of the first molar tooth ; *m 2*, the second molar tooth ; *m 3*, the third molar tooth.

Fig. 2. Alveolar border and fractured crowns of the second and third molar teeth, *m 2*, *m 3* : *s*, the margin of the symphysis ; *i*, the tusk ; *m 1*, socket of the first molar.

Fig. 3. Inside view ; showing the form and extent of the symphysis, *s*, *s*.

Fig. 4. Lower border of the same fragment : *i*, the tusk.

Fig. 5. Lower border of the posterior part of the ramus of the jaw of the same species of *Diprotodon* (see No. 1461.) ; showing the inflected angle at *a*.

Fig. 6. Outline of the transverse section of the incisive tusk of the *Diprotodon australis*, showing the partial coating or enamel at *e*, *e*.

PLATE VIII.

Views of the right ramus of the lower jaw of the *Nototherium inerme* (see No. 1505.) : half the natural size*.

Fig. 1. Outside view ; with ideal outlines of the crowns of the four molar teeth.

Fig. 2. Alveolar border.

Fig. 3. Inside view, showing the short symphysis and the rounded and inflected angle of the jaw.

Fig. 4. The fractured surface of the anchylosed symphysis, showing the compact osseous texture, and the absence of any socket for an incisive tusk.

Fig. 5. Outline of the crown of the last molar, natural size, showing the thickness of the enamel and the divisions of the pulp-cavity which divides and descends into the fangs.

PLATE IX.

Views of the posterior part of the left ramus of the lower jaw of the *Nototherium Mitchelli* (see No. 1506.) ; half the natural size.

Fig. 1. Outside view, with restored outlines of the penultimate and last molar teeth.

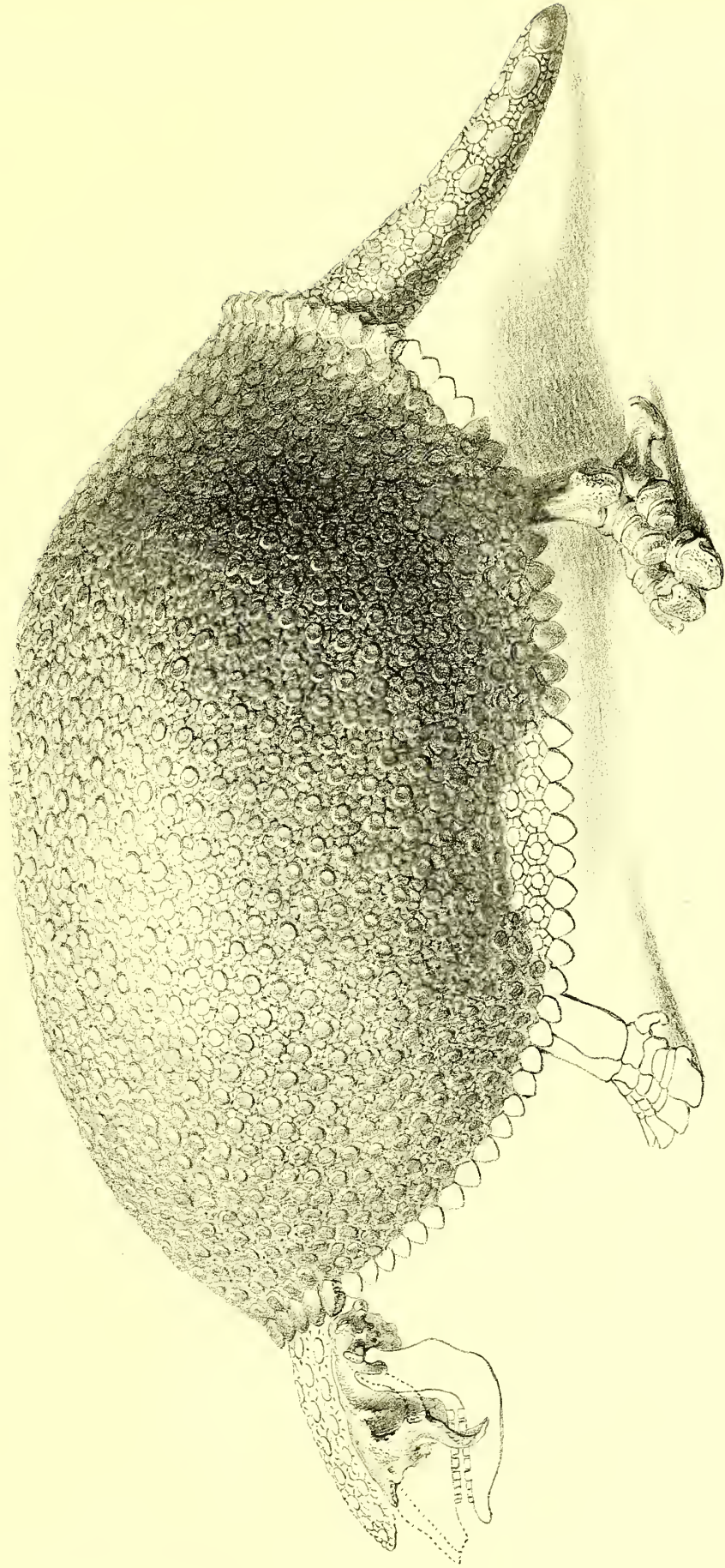
* The specimen has been intentionally drawn unreversed upon the stone, in order that the figure might print off as the left ramus, and so correspond and facilitate the comparison with Plate IX.

- Fig. 2.* Alveolar border : *c*, the orifice of the dental canal.
Fig. 3. Inside view : *a*, the inflected angle ; *c*, the orifice of the dental canal.
Fig. 4. Fraetured surface of the ramus : *c*, dental canal ; *d*, part of an alveolus.
Fig. 5. Lower border of the jaw, showing *a*, the inflected angle.
Fig. 6. Outline of the crown of the last molar tooth, natural size.

PLATE X.

- Fig. 1.* Upper view of the astragalus of, probably, a species of *Nototherium* (see No. 1509.) : *a*, outer or fibular division of the upper articular surface ; *b*, inner or tibial division ; *c*, scaphoid articular convexity continued from the tibial surface ; *d*, rough depression, partially dividing the tibial from the scaphoid surface.
Fig. 2. Under view of the same astragalus : *e*, flat calcaneal surface ; *f*, part of the surface corresponding with a prominence on the os calcis ; *g*, descending process of the articular surface corresponding with a depression on the os calcis ; *c*, scaphoidal convexity.
Fig. 3. Upper view of the astragalus of the Wombat.
Fig. 4. Lower view of ditto : the same letters indicate the same parts as in the figures of the gigantic analogue of this singularly formed bone.
Fig. 5. Inside view of the os calcis of, probably, the *Diprotodon australis* (See No. 1486.) : *a*, calcaneal prominence for the attachment of the tendo achillis ; *b*, an obtuse process from the inner and under part of the bone ; *d*, the tendinous groove on the inner side of the bone ; *e*, the astragalarticular surface ; *g*, the depressed portion of that surface corresponding with the prominence, marked *g*, in *Fig. 2*.
Fig. 6. Outside view of the same os calcis ; showing *e*, the tendinous perforation on the outer part of the base of the calcaneal process *a* ; *f*, the cuboidal concave articular surface.
Fig. 7. Upper surface of the same os calcis.
Fig. 8. Under surface of the same os calcis, showing the wide tendinous groove continued from the perforation.

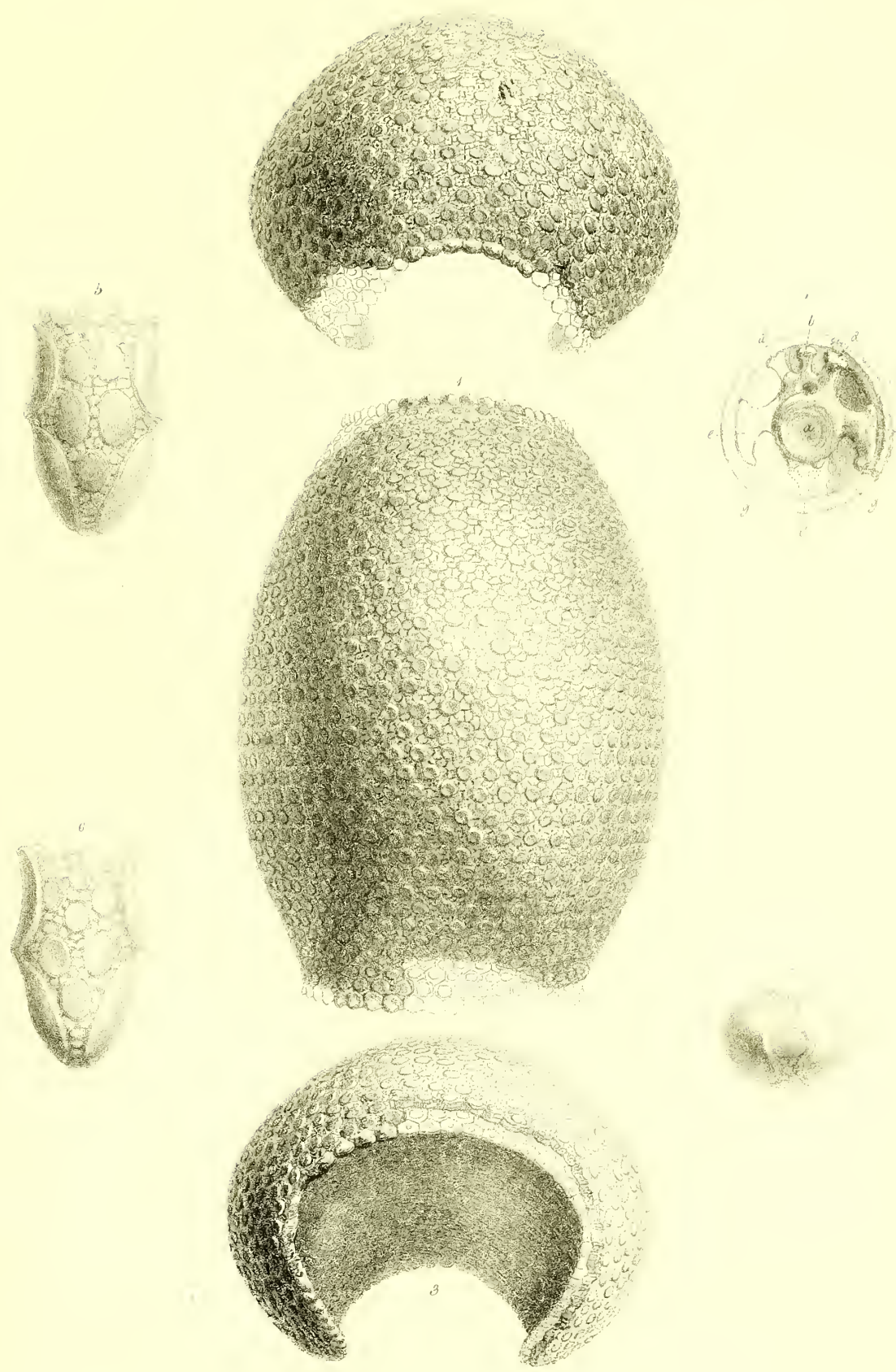
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RED LION COURT, FLEET STREET.



5. Mart. del ex lituo.

Hallmaedel & Walton. Lithographers.

GIGANTIC EXTINCT ARMADILLO (*Glyptodon clavipes* Ow)
Length of the Carapace 5ft 7in.



EXTINCT GIGANTIC ARMADILLO

Fig. 1, 3 one sixteenth naïve size Fig. 4, 5 one fourth naïve size



FIG. 10. CRANIUM OF *CLUPEOIDES LARYEO*.

Cranium of Clupeoides laryeo.

PLATE III.

Fig. 1.

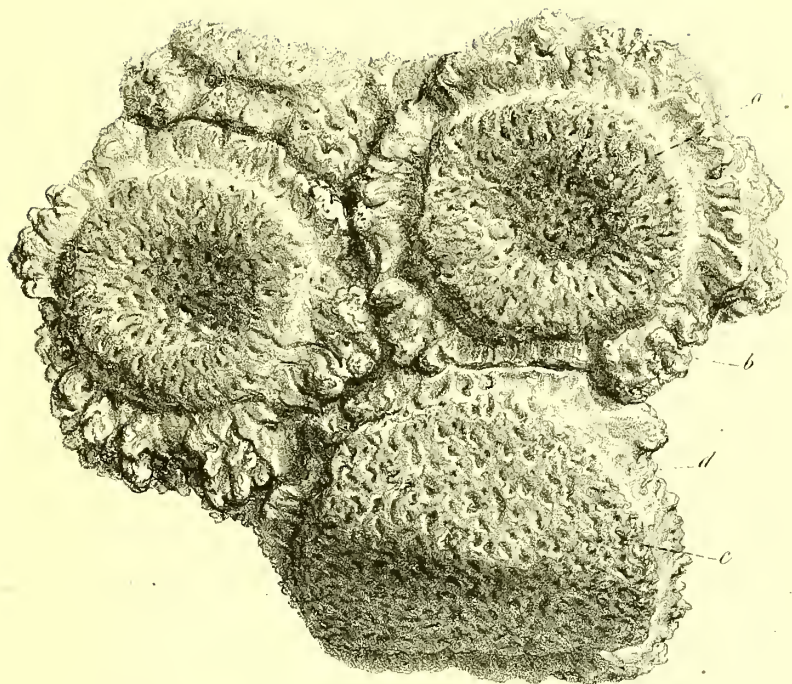


Fig. 3.

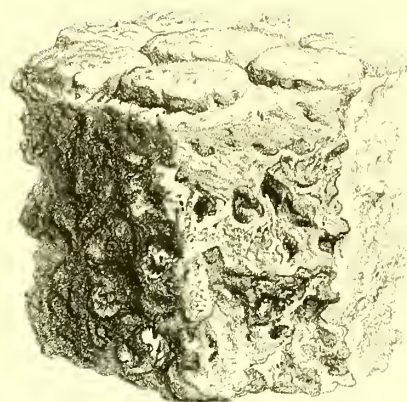


Fig. 2.

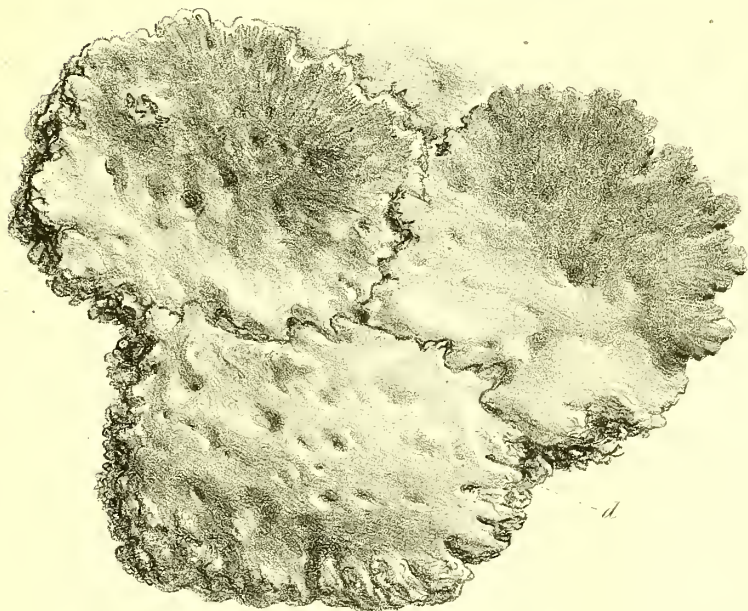


Fig. 4.

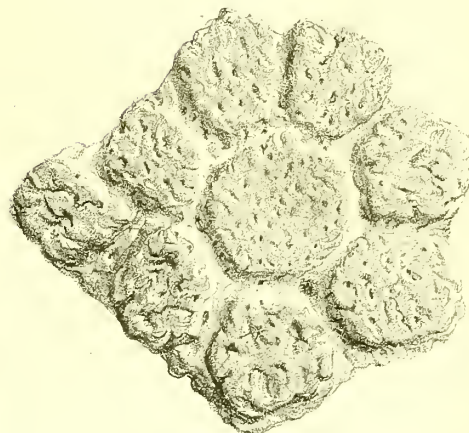


Fig. 6.

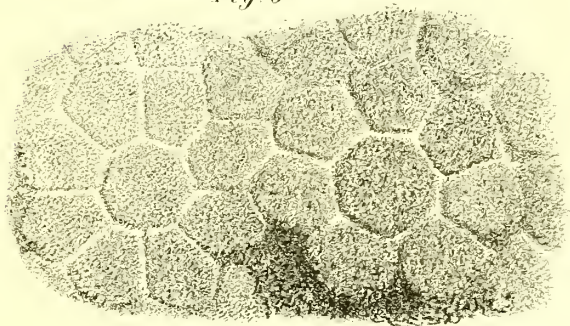
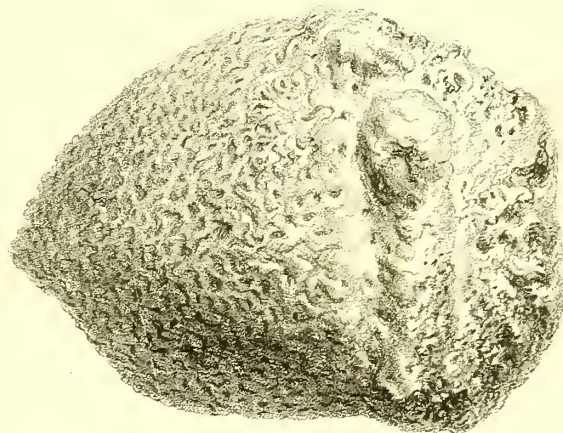


Fig. 5.



Lithog. from Nature by G. Schary

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1-5 *Glyptodon clavipes*,

6 *Glyptodon ornatus*.

Fig 1.

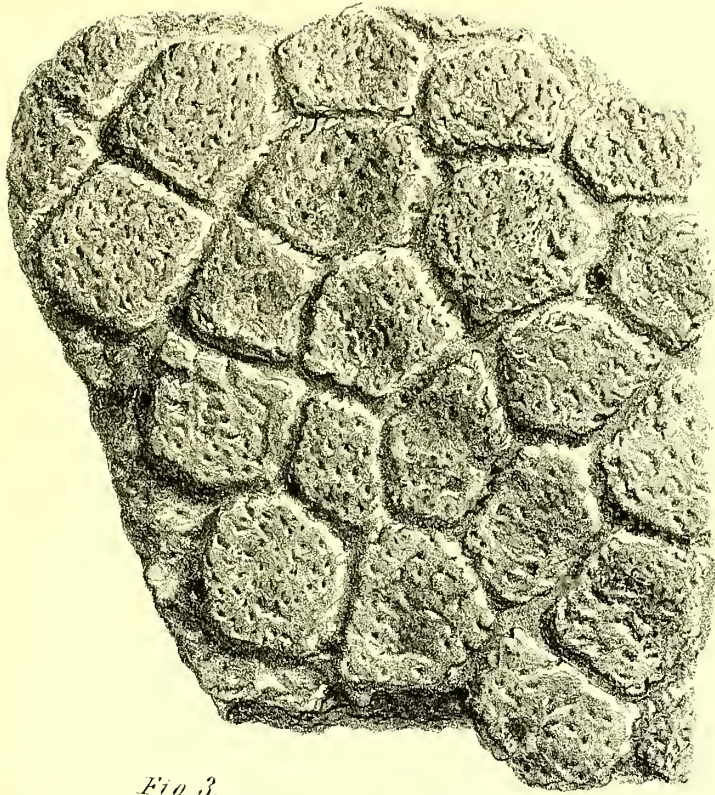


Fig 2.



Fig 3.

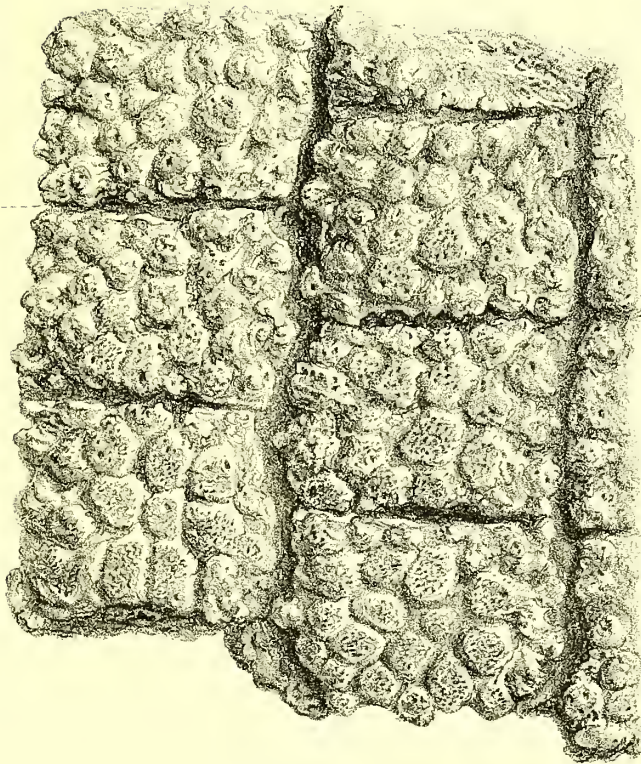


Fig 4.



Fig 5.



Lithog from Nature by G. Scharf

Engraved by Mulhmann & Walton.

1. 2. *Glypteden reticulatus*, 3. 5. *Glypteden tuberculatus*.

Fig. 1. High Light in the Queen

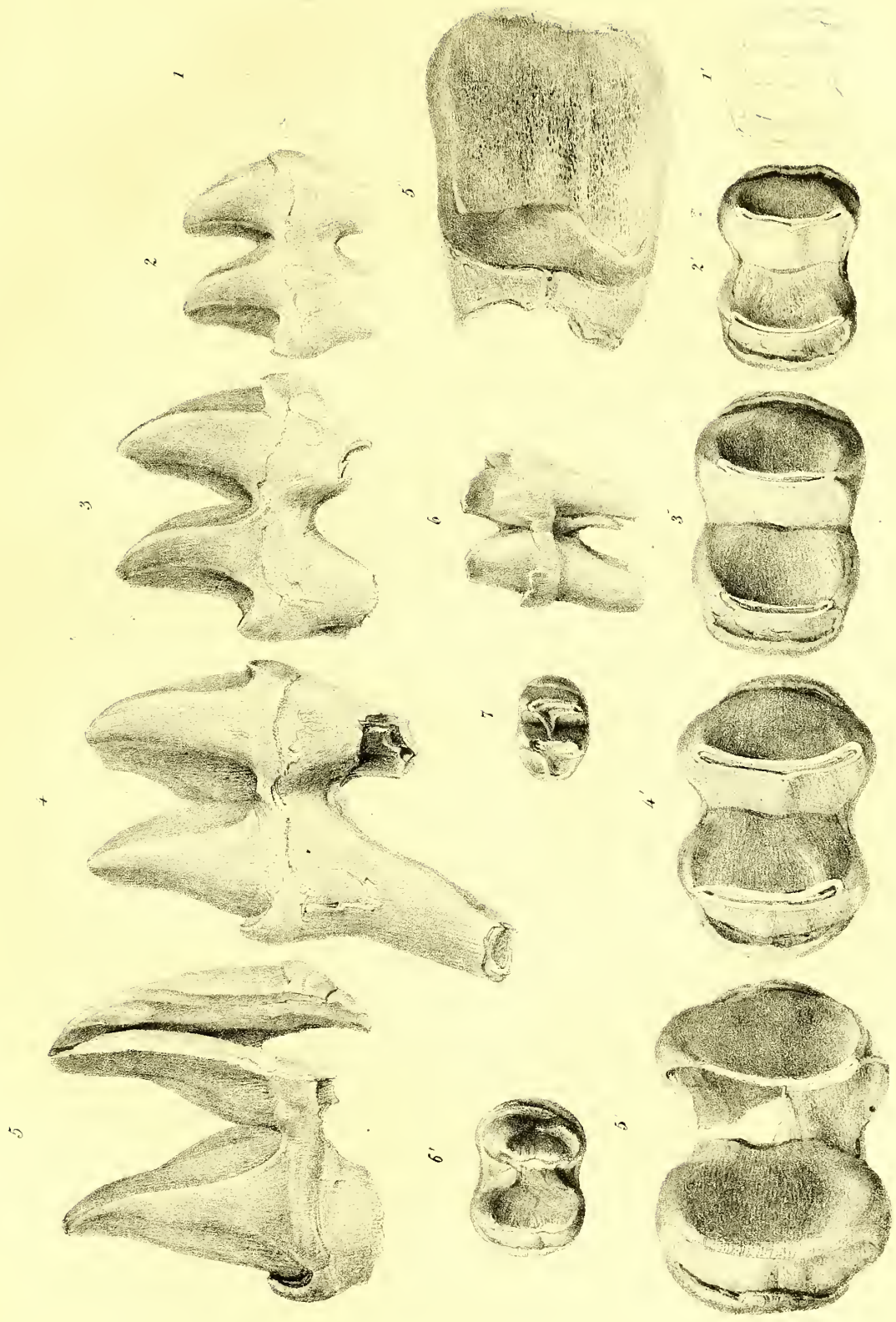
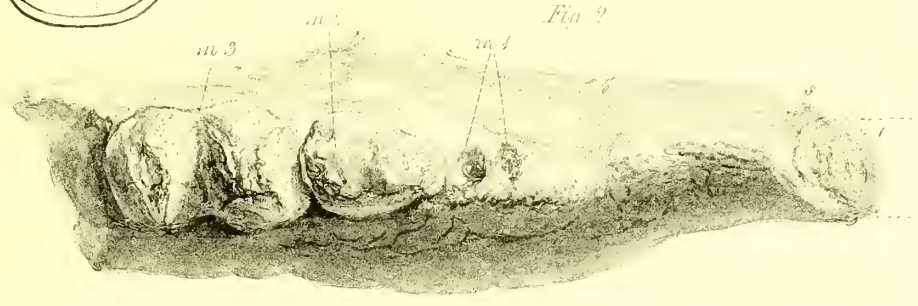
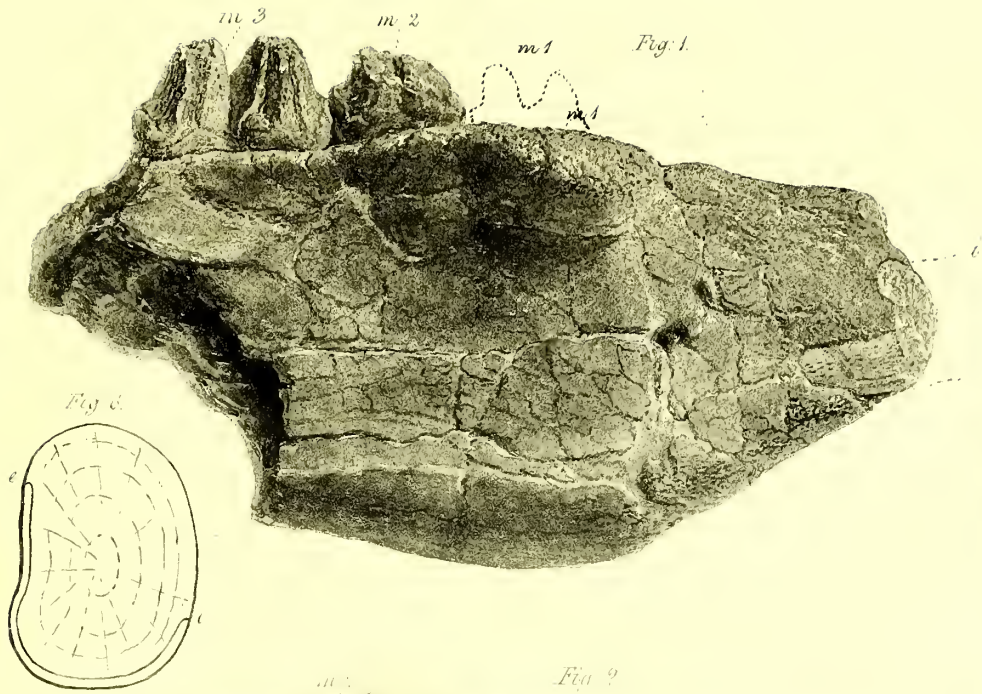


Fig. 2. High Light in the Queen

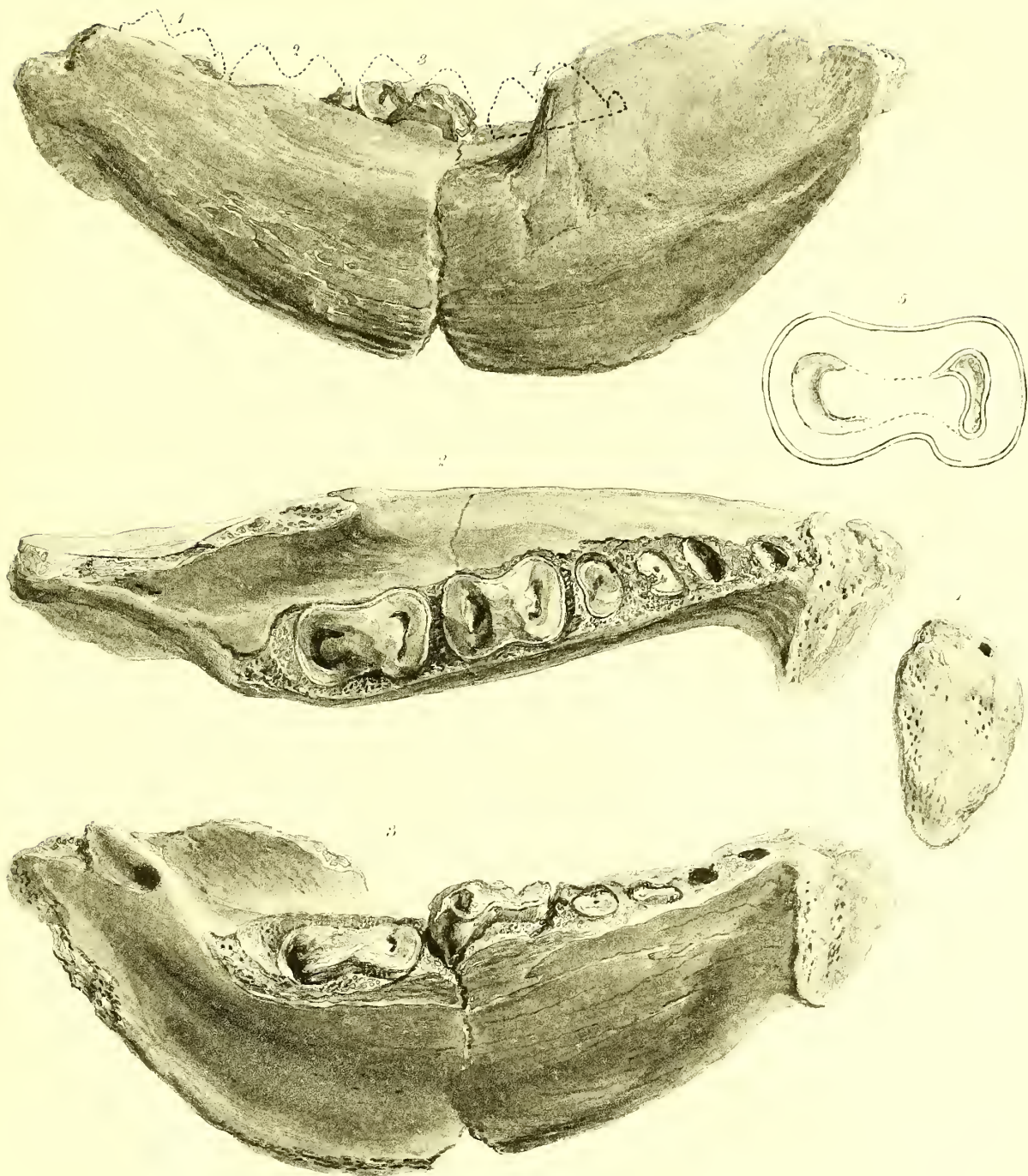
1-5 Diphrotodon australis. 6 Taperus. 7. Macropus. Not Sex



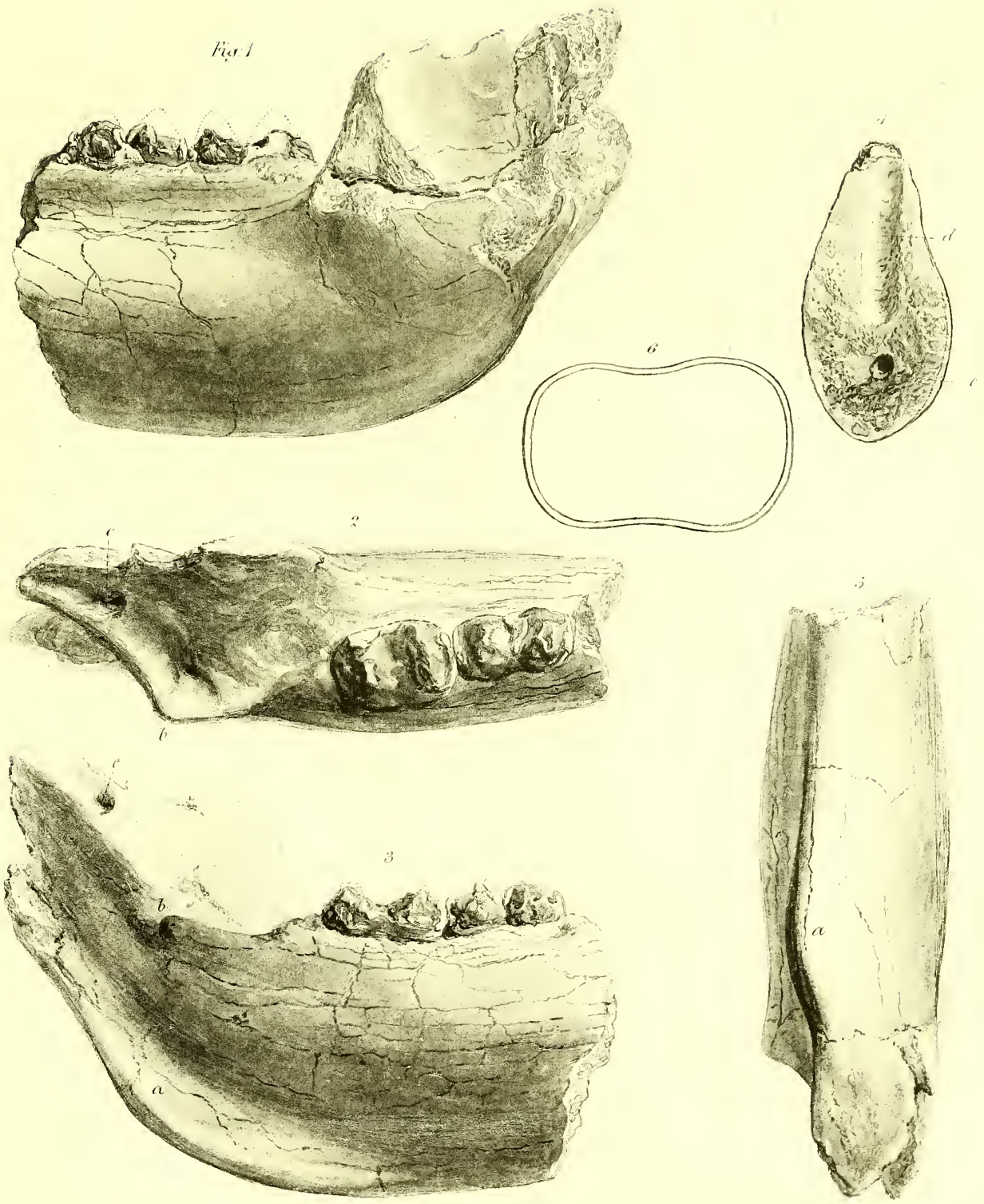
C. Zittelmandel's Isotria Isidont from Nature by G. Schatz.

Diprotodon australis 1/2 Nat size.

Fig 1.

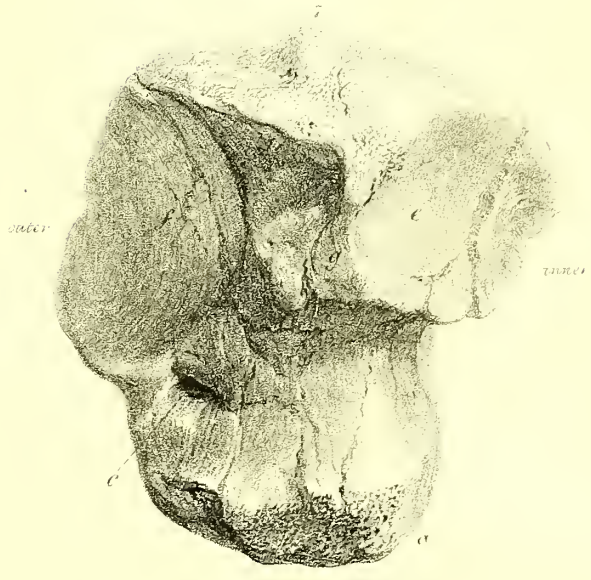


Neotherium thornei, de Nat. Sixt.



Hallmandels Patent Lithotint from Nature by G. Schrey

Neotherium Mitchellii $\frac{1}{2}$ Nat. Size



1 & 2. Astragalus of *Neotherium*. 5 & 6. Calcaneum of *Diprotiden*.
7/2. Nat. Size.





