DESCRIPTION OF PLATE XXIV.

Rhinoceros hemitœchus.

The figures in this Plate have been reproduced from drawings by Mr. Dinkel of the original specimens. (See pages 351 & 509.)

Fig. 1. Is a lateral view of the 'Northampton Skull' in the British Museum (Cat. No. 20,013), right side.

Fig. 2. Is a lateral view of skull found in 'Minchin Hole,' left side.

Fig. 3. Is a view of upper surface of skull found in 'Minchin Hole.'

Fig. 1.

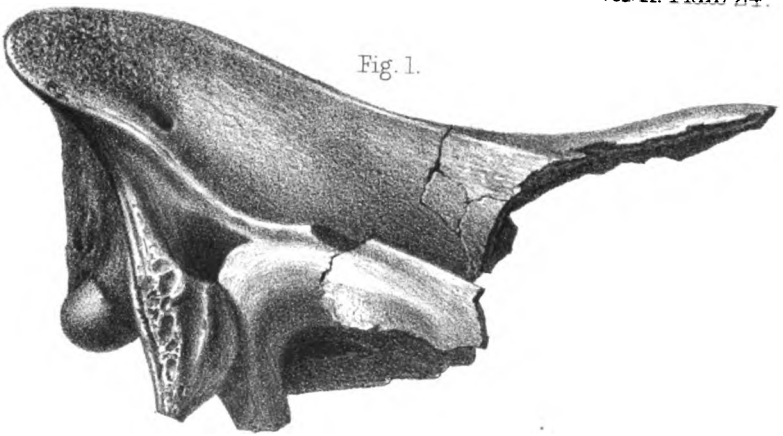


Fig. 2.

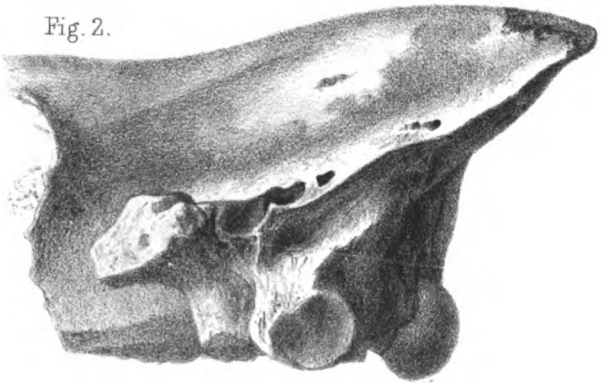
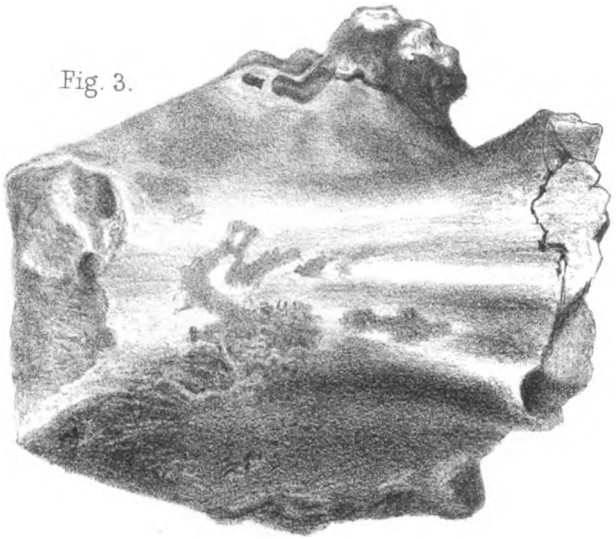


Fig. 3.



J. Dinkel del. et lith.

Rhinoceros hemitoechus.
1. Northampton. 2, 3. Minchin Hole.

W. West imp.

ossified. A third milk molar in wear is very like Cesell's tooth from Rome. (See Pl. XXV. figs. 2, 3, and 4.)

Examined also a right maxillary with milk dentition. (See Pl. XXI. figs. 2 and 3.) The first, second, and third deciduous teeth are beautifully seen in place. The teeth are worn, and part of the alveolus of the fourth milk tooth is also seen. The second tooth has three fossettes besides the entrance of the valley. The specimen is exquisitely fine. There is no matrix on it, but it is probably from Minchin Hole.

Length of three teeth, 3·8 in. Length of 3rd milk molar, outer side, 1·7 in. Greatest width of ditto in front, at base, 1·6 in. Length of 2nd milk molar, 1·4 in. Length of 1st milk molar, 0·9 in.

[References to other bones of the skeleton of the *Rhinoceros hemitœchus* from the Gower Caves are to be found in Dr. Falconer's Note-books. The femur was compared with the femur of *Rhinoceros tichorhinus* of Mr. Lucas from Port Inon, referred to by Dr. Buckland. It was found to differ remarkably ' in its much shorter proportions, and in the very bold curve intercepted between the third trochanter and the outer condyle. The bone itself is absolutely much shorter and smaller, and the species must have stood on proportionally shorter legs.' The following reference to a tibia is also important:—' The bone is short and squat, as compared with the corresponding bone of *Rhinoceros tichorhinus*, and the fibula is ossified with the tibia along a much greater extent of surface. This specimen is of great importance in giving the characters of the species.' The bones of the cranium are also referred to in the author's essay on ' the Ossiferous Caves of Gower.' In a list of Rhinoceros remains from Bacon Hole, in the Swansea Museum, mention is made of the lower half of right humerus, upper half of radius with articulating surface of ulna, pelvis, cervical and dorsal vertebræ, a thick and short metatarsal bone, &c.—ED.]

VIII.—NOTE ON RHINOCEROS HEMITŒCHUS FROM FOLKESTONE.

27th September, 1858.

In Mr. Mackie's collection of fossils from excavations made at Folkestone there is a specimen (labelled ' Battery ') of the last upper molar, left side, of *R. hemitœchus*. The shell is nearly entire, but the fangs are wanting. The grinding surface is a little damaged by minute chips, but there is no sign of wear. The crown, however, is very perfect, and presents the characters of the species well marked—namely, the last barrel compressed, and emitting from the middle forwards a large crochet plate. The valleys have a thick coat of cement, but the outside is denuded. This is an important specimen, and ought to be figured. It entirely agrees with Colonel Wood's specimens from Bacon Hole Cave.

IX.—NOTE ON RHINOCEROS HEMITŒCHUS FROM ORESTON.

College of Surgeons, 10th August, 1859.

To-day compared the Rhinoceros teeth from Oreston, described by Whidbey in the ' Phil. Trans.' for 1817, -21, and -23, and referred to by Owen in Brit. Fos. Mam. as belonging to *R. tichorhinus*. There are only three upper molars, Nos. 877, 878, and 879. The first is the right upper antepenultimate, and the second the left do. of probably the

same individual. Both are broken, but conversely, *i.e.* the anterior end of 877 and the posterior of 878, so that jointly they give the complete form of one tooth. They agree in both showing the crochet of the posterior barrel stretching across to join the anterior barrel, as in Cuvier's drawing.[1] They are quite unlike *R. tichorhinus*, and I believe that they agree with *R. hemitœchus*.

X.—Note on Rhinoceros Hemitœchus from Crawley Rocks.

Oxford, 11th August, 1863.

The Crawley Rocks Rhinoceros tooth in the Oxford Museum is a very fine penultimate or last premolar of *R. hemitœchus*, upper jaw, right side, with crochet in two combing plates. Length of crown outside, 1·74 in.; do., inner side, 1·25 in. The tooth is beautifully marked, and ought to be figured. The valley is very deep. In the Kirkdale series, besides the large worn molar there are two premolars, both germs, the one exactly corresponding in size and form with the Crawley Rock premolar, but intact, and has only one developed combing plate; the second is also an intact germ of the antepenultimate premolar, left side, of the same species; the entrance of the valley here also being vertical. Both these specimens profess to be from Kirkdale, but they differ in mineral appearance from the other. They bear no label, and they agree in condition exactly with the Crawley Rocks specimen. Can there be a mistake? Are they from Gower?

Oxford Museum, 5th July, 1860.

Saw one premolar of *Rhinoceros hemitœchus*, well marked, in a drawer, and labelled 'Crawley Rocks.'

II. NOTES ON RHINOCEROS ETRUSCUS. (Falc.)

(*Extracted from Dr. Falconer's Note-books.*)

I.—Note on Rhinoceros Etruscus in Oxford Museum.[2]

6th May, 1858.

In Buckland's collection there is a left upper maxillary and half palate of a Rhinoceros labelled '*Rhinoceros leptorhinus* from Venice,' in a hard ferruginous matrix of gritty sandstone. It contains four molars *in situ*, namely, p.m. 3 and 4, and t.m. 1 and 2, and also the broken-off discs of p.m. 2 and t.m. 3. The two premolars are of the second set and half worn. The first true molar is much worn; the penultimate is half worn. The enamel is very smooth, and the teeth are smaller than in the Kirkdale specimen. There is a considerable basal bourrelet at the anterior end of the last premolar and of the penultimate true molar. There are no combing processes whatever projecting into the transverse valley, and no appearance of cement. It reminds me of Ansted's specimens from Malaga. (See p. 360.) The outer surface of the two true molars from the termination of the valley is gone, but it shows the transverse valley well. The first true molar has its anterior outer corner broken, and the third and fourth p.m. have their

[1] See *antea*, p. 337.—[Ed.]

[2] See p. 348, *note*.—[Ed.]

DESCRIPTION OF PLATE XXV.

RHINOCEROS HEMITŒCHUS AND RHINOCEROS ETRUSCUS.

Fig. 1. Outer surface of left ramus of young lower jaw of *R. hemitœchus*, with greater part of symphysis and whole of horizontal ramus, and containing the first four milk molars. The figure is one-half of the natural size, and has been copied from a drawing of the original specimen executed for Dr. Falconer by Mr. Dinkel. The specimen is from 'Minchin Hole,' and is described at page 352.

Figs. 2, 3, and 4. Represent upper milk molars of *R. hemitœchus*, from 'Minchin Hole,' of the natural size, copied from drawings of the original specimens executed for Dr. Falconer by Mr. Dinkel. (See page 352.) Fig. 2 shows the second and third milk molars. Fig. 3 is a germ of the second milk molar. Fig. 4 is a detached third milk molar.

Figs. 5, 6, and 7. Represent three upper molars of *R. Etruscus*. The drawings have been made by Mr. Dinkel from three casts presented to Dr. Falconer by Professor Meneghini, of Pisa, and now in the British Museum. They are of the natural size. Fig. 5 shows the crown of the last (t. m. 3) upper molar of the left side. Fig. 6 is the last upper premolar (p. m. 4), right side. Fig. 7 is the penultimate upper molar (t. m. 2), right side, mutilated at posterior outer angle.

Fig. 1.

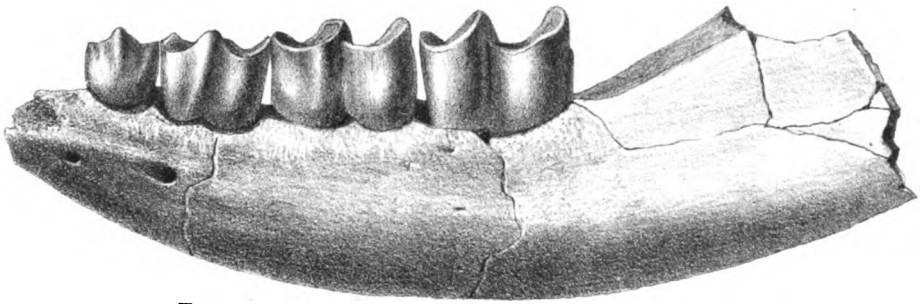


Fig. 2.

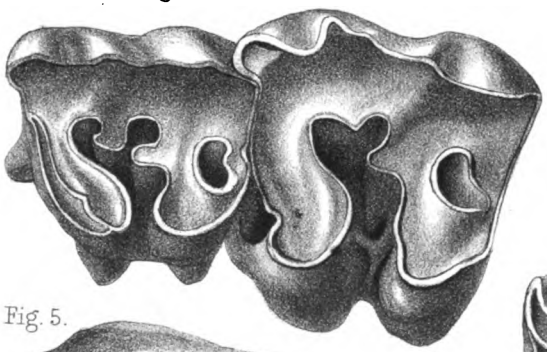


Fig. 3.

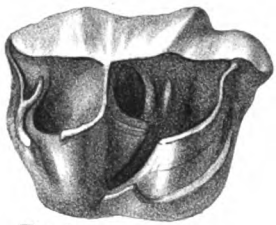


Fig. 4.

Fig. 5.

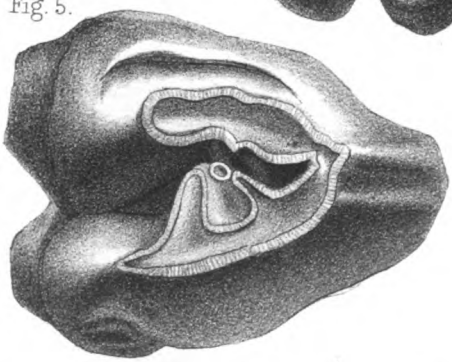


Fig. 7.

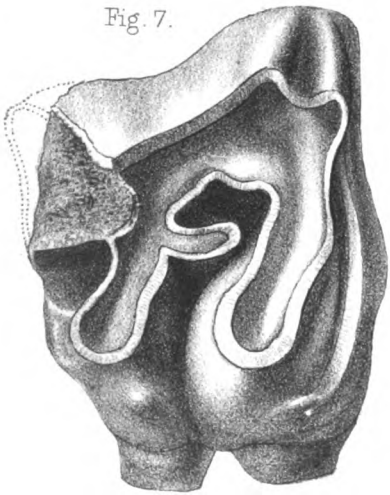
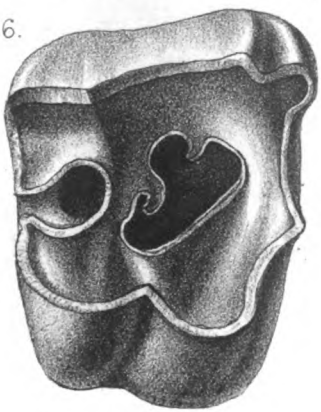


Fig. 6.



J.Dinkel del et lith.

1,2,3,4. Rhinoceros hemitoechus, Gower Caves.
5,6,7. Rhinoceros Etruscus from Pisa.

W. West imp

outer surface as to the valley broken off. There is a little mammilla between the barrels of the first and second true molars. In the third and fourth p.m. the end of the valley is only a very slight cleft; in the true molars it is an open flexuous fissure.

Dimensions.—Length of 5 teeth (2nd p.m. to end of 2nd t.m.), 7·5 in. Length of 2nd t.m. at middle, 1·85 in. Width in front, 2·2 in.

Can this really be from the Sub-Apennines?

II.—Comparison of Rhinoceros of Norwich Lacustrines with 'Venice' Upper Jaw in Oxford Museum.

7th May, 1858.

Compared the Rev. Mr. Gunn's detached upper molar (Pl. XXII. fig. 5) from the Norwich lacustrines with the upper jaw labelled '*Rh. leptorhinus* from Venice' in Buckland's collection, and found the most important agreement. Gunn's also belongs to the left side. In form Gunn's would agree best with the last premolar from the smaller size of the posterior barrel, but unluckily the fracture of the outer surface of the Venice fossil prevents a rigid comparison. They agree in the following important points:—1. Exact similarity of smooth enamel surface. 2. Decided anterior basal bourrelet, worn down in Gunn's. 3. Like thinness of enamel. 4. Sweep antero-posteriorly of termination of large valley, and its nearly isolated form. 5. Openness of gorge of transverse valley.

Dimensions.

	Gunn's specimen	Venice second true molar
Length of outer side at constriction		1·8
Length of inner side		1·6
Breadth near middle, anterior barrel		about 2·2
Breadth behind, at base of crown		2·2
		First true molar
Length of outer side (greatest)	2·0	1·75
Length at constriction	1·75	1·6
Length of inner side	1·85	1·7
Breadth of middle, anterior barrel	2·2	2·2 nearly
Breadth behind at base	1·9	2·15
Height of enamel crown, posteriorly	1·2	1·

Norwich, July, 1863.

Examined the Rhinoceros jaw in Fitch's collection. It belongs to *R. Etruscus*. M. Lartet detected in it the remains of the large mentary foramina. 'Got at Anderson's the fisherman's a portion without ends of a femur of an old *R. Etruscus*, very characteristic.'

III.—Description of Crania of R. Etruscus in the Grand Ducal Museum at Florence (Plates XXVI. and XXVII.).

18th May, 1859.

In the Museum at Florence is preserved a superb skull of *Rhinoceros Etruscus* from the Val d'Arno, nearly entire; two-horned, and very old. There are six molars on either side, of which even the last is worn to the base. The skull is very little crushed, and there are very few restorations. The nasals are perfect to their very tips on one side,

and are slightly emarginate and arched at the side, very much as in *R. tichorhinus*. They send down a vertical bony partition, which is deepest in front; the posterior part is broken, but does not appear to have been ever complete behind (only partial); what remains occupies one half of the nasal echancrure. The incisive bones are broken off, but on the right side a considerable portion of the diasteme remains. The arch of the nasals is higher than in *R. tichorhinus*; and the greatest height of the septum is in front—the septum being lower behind, which is the very reverse of what is observed in *R. tichorhinus*. The broken part of the incisives has been badly restored in coloured gypsum, but the join is easily recognizable. Compared with the Lyons skull of *R. megarhinus* (Plate XXXI. fig. 3), the Florence head is considerably smaller in all its dimensions, and the lower jaw and teeth are in keeping. Viewed from the top, the skull in contour resembles more that of the *R. tichorhinus* (Cuv., 'Oss. Foss.,' Pl. 160, fig. 5, and Gervais of the Montpellier skull, 'Trans. Academ. Montp.' tom. xi. Pl. E. fig. 2) than any of the others. Length from about outer margin to occipital crest, 14· in., and from ditto to tip of nasals about 12·5 in., or as 7 : 6.

The nasal horn rugosity is enormous, projecting greatly at its central nucleus; then there is a smooth interval of about three inches, and then an indistinct and not much raised rugosity for a second horn. This frontal horn was probably small; and there is here nothing like the enormous confluent rugosity of *R. tichorhinus*. The right orbit with rim is nearly entire, but the tubercles are broken off; they are smoothly restored on left side. The maxillary bone on right side is a little crushed below the infra-orbitary foramen. The zygomatic arches are quite entire, thin and high, and but little crushed. The articular surfaces are also entire on both sides. There is only a slight rise for the frontal horn between the orbits. The frontal and sincipital surfaces are smooth, with a tablet showing about the same width as in Gervais, Tab. 11, fig. 2; the two bounding ridges are visible but indistinct. (There is some restoration between the temporal arches on both sides.) There is hardly any sincipital pyramid, but the occiput is slightly crushed on the left side. The occipital plane rises nearly vertically, but is overarched at the sides by the projecting occipito-parietal crest, and an easy echancrure in the middle. This part of the skull is formed very much after Gervais' figure above quoted. The occipital plane is wide, and very low as compared with width. (Some little plaster restoration on right side.)

Florence, 19th May, 1859.

The skull of *Rhinoceros Etruscus* in the Florence Museum has the following characters (see Plates XXVI. and XXVII.):—

1. It is smaller and more slender than the horned rhinoceros of Sumatra (Cuv. Pl. IX. *Rhin.*).

2. The cerebral portion is very elongated and shelving behind over a vertical occiput; it is but little elevated behind.

3. The skull is very flat from the occipital crest forwards; there is no pyramid properly so called (*vide* 'Dimensions').

4. The posterior surface of the occiput (when the skull is placed upon the plane of the teeth) is inclined forwards, and is overarched by the shelving occipital crest (Plate XXVI. fig. 1).

5. The nasal bones are more elongated than in the Cape species;

DESCRIPTION OF PLATE XXVI.

Rhinoceros Etruscus.

Three different views of cranium in the Florence Museum, one-fifth of the natural size. Fig. 1. Upper surface. Fig 2. Profile view, showing well the incomplete nasal septum. Fig. 3. Lower surface, showing palate and series of six molars on either side well worn. These figures have been copied by Mr. Dinkel from drawings executed for Dr. Falconer by Vincenzo Stanghi, artist at Florence. (See page 356.)

Fig. 1.

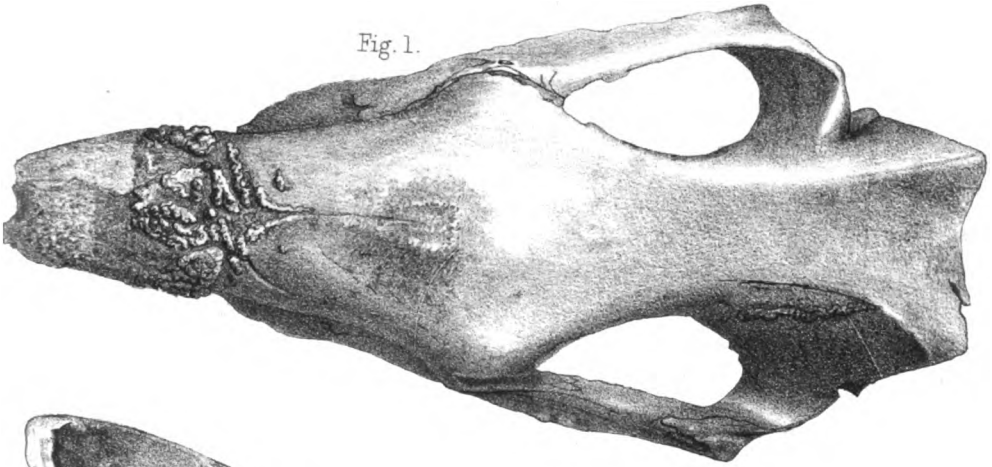


Fig. 2.

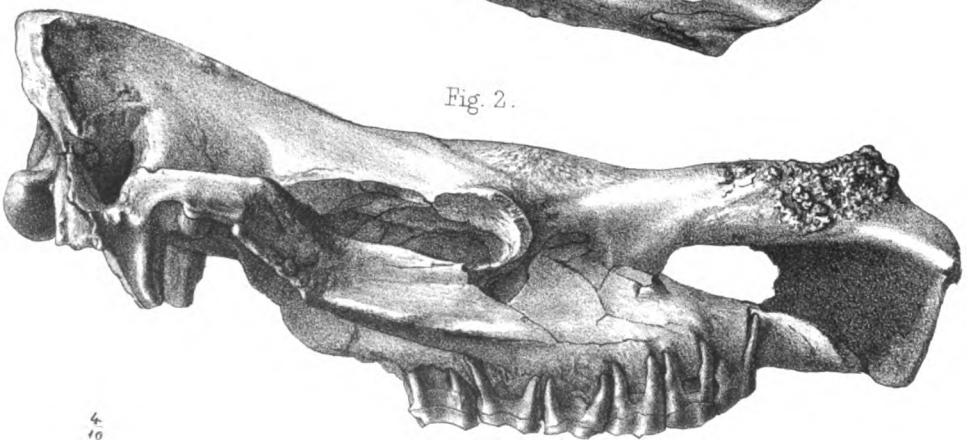
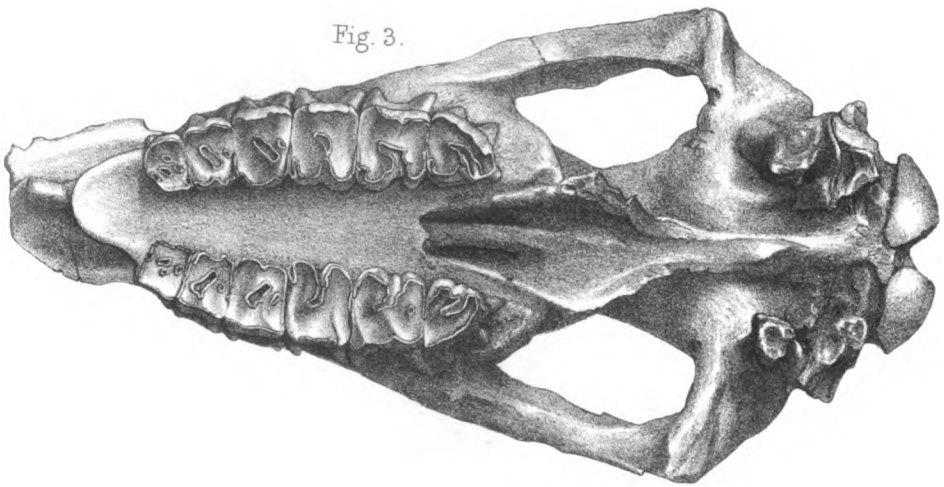


Fig. 3.



Stanghi del. J.Dinkel lith. Rhinoceros Etruscus. W.West imp.

DESCRIPTION OF PLATE XXVII.

Rhinoceros Etruscus.

Views of cranium, lower jaw, and teeth in the Florence Museum. The figures have been copied by Mr. Dinkel from drawings executed for Dr. Falconer by Vincenzo Stanghi, artist at Florence. (See page 356.)

Fig. 1. Posterior view of cranium represented in Plate XXVI., showing occiput, zygomatic arches, occipital condyles, and foramen magnum, one-fourth of the natural size.

Fig. 2. Profile view of lower jaw, outer surface, one-fourth of the natural size.

Fig. 3. Same lower jaw, viewed from above, showing crowns of molars far advanced in wear, one-fourth of the natural size.

Fig. 4. Symphysial portion of same lower jaw, viewed from below, one-fourth of the natural size.

Fig. 5. Four molars of upper jaw, left side, smaller and less advanced in wear than those in skull represented in Plate XXVI., fig. 3. Three-fourths of the natural size. (The dimensions almost correspond to those given in page 359.)

Fig. 1.

Fig. 5.

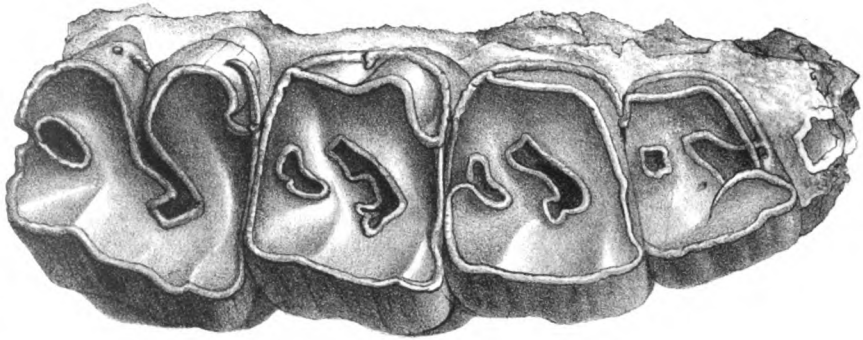


Fig. 2.

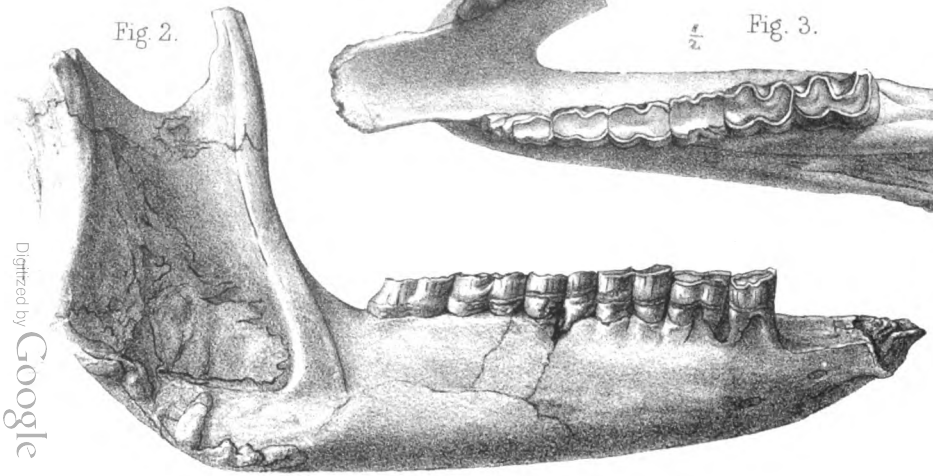


Fig. 3.

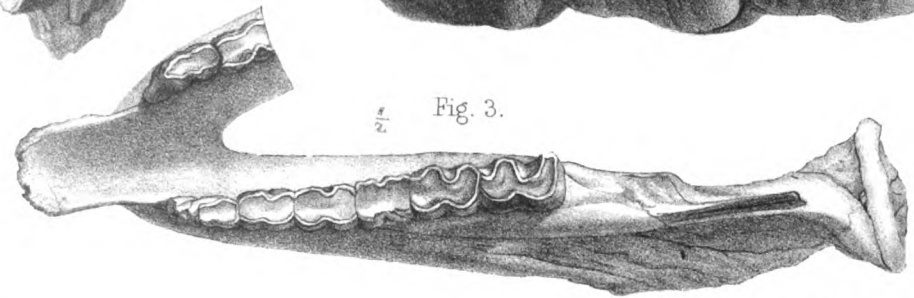
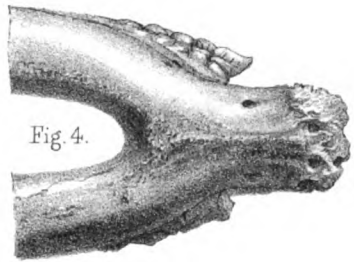


Fig. 4.



Stanghi del. J Dinkel lith.

Rhinoceros Etruscus.

W West imp.

they are vaulted forwards, but not uniformly, as in *R. tichorhinus*; they are bifid at the apex and then throw down a septum which terminates below in a thick knob (Plate XXVI. fig. 1), and is incomplete behind (*vide* 'Dimensions'). The nasal horn is very rough and overlaps the sides of the nasals with an excessively rugous conical raised nucleus; there are no *ramures*, as in *R. tichorhinus* and *R. megarhinus*; the edges of the nasals are thin and arched; the nasal echancrure is narrow at the bottom, and then arches high forwards, followed below by a rim on either side of the septum.

6. The zygomatic arches in front are nearly horizontal; then the posterior part rises upwards in the arch to the glenoid surface, but not nearly so much as in *R. megarhinus*. (In the detached maxillary and orbitary fragment there is a distinct post-orbital tuberosity defining the orbit behind.)

7. The temporal fossæ are very much as in Cuvier's fig. of *R. tichorhinus*, fig. 5, Pl. IX. *Rhin.*; and in the two-horned Sumatra Rhinoceros, fig. 3.

8. The incisive bones join on to the septum, but are broken. (In the right maxillary specimen, 2·2 inches of diasteme remain.) There are no upper incisors apparent, as certainly there are none in the lower jaw.

9. The orbit is placed mostly above the seventh molar, but its anterior border advances as far as the middle of the sixth or penultimate molar in the large skull. (In the right maxillary fragment it advances only to the rear part of the sixth molar; the same remark applies to the skull in two pieces.)

10. The suborbitary foramen is situated between the third and fourth premolars in the large skull. In the maxillary fragment of the head in two pieces it is over the fourth premolar, close to the nasal echancrure between third and fourth premolars.

11. The auditory foramen is large and in a line with the upper edge of the zygomatic arches.

Viewed above, the skull is very like that of *R. tichorhinus*, but it is not so wide and the nasals are more elongated. The interval also between the orbits is narrower, and the cerebral portion longer. The temporal fossæ are of considerable extent; their bounding edges being less defined than in *R. tichorhinus*; they are nearly parallel in the middle, but diverge into the occipital crest behind, and into the orbits in front, as in *R. tichorhinus*. The frontal tableau is longer and less pronounced; it is less broad than in *R. tichorhinus*, but wider than in *R. Indicus*. There is no hole with *ramures* to the nasal horn. The occiput is inclined in front with two diverging ridges and a deep depression; but is shelved over by the projecting crest.

Measurements of the Rhinoceros Skull and Lower Jaw. at Florence.—Skull.—Length of 6 last molars, right side, 8·8 in. Length of 3 last (true) molars, right much worn, 5·0 in. Length of 3 premolars, 4· in. Total length of skull from occipital lateral crest, measured along chord to overhanging tip of nasal, 25·25 in. Total length of ditto from posterior surface of occipital condyle to tip of nasals (vertical plane), 25· in. Total length from nasal echancrure left side to tip of nasals (by callipers), 7·7 in. Total length from nasal echancrure (left) to anterior border of orbit (exactly), 4·5 in. Total length from anterior border of right orbit to occipital crest (lateral), 14·0 in. Total length from anterior border occipital foramen to palatine echancrure, 12· in. From palatine echancrure to tip of nasals, 12· in. Greatest width across zygomatic arches in line with articular surface, 12·75 in.

Extreme length of right temporal cavity taken at base of skull, 5·2 in. Greatest width of ditto between pterygoid and inside of zygoma, 4·4 in. Greatest constriction of skull between zygomatic arches, 4· in. Length from posterior surface of occipital condyle, to apex of pterygoid alar process, 9·4 in. From ditto to posterior boundary temporal fossa below (edge of articular), 6·4 in. Length of diasteme remaining, right side, 1·5 in. Interval of palate between p.m. 2, 1·5 in. Interval between outer surfaces (posterior end) of p.m. 2, 4·7 in. Interval between anterior barrels of last molars, 2·5 in. Interval between outer surfaces of ditto, 6·6 in. Transverse extent of articular surface of glenoid, 3·9 in. Stretch across condyles to outer border, 5·2 in. Height of occipital crest, right side, from lower surface of condyle, 6·5 in. Height of right styloid (left a little broken), about 2·1 in. Interval between ditto, inside, at apex, 3·8 in. Length from palatine echancrure to posterior edge pterygoid alæ at base, 5·8 in. Length from posterior surface condyle to posterior surface of last molar, 11·6 in. Constriction of skull below auditory foramina, 7·1 in. From anterior border, right orbit, to tip of nasals, about 12·5 in. Length of zygomatic arch from posterior fang of 6th molar or penultimate, in a line with anterior margin of orbit, to border of auditory foramen, approximatively, 10· in. Antero-posterior extent remaining of septum, upper margin, 4·7 in. Antero-posterior extent remaining at middle, about 4·2 in. Width of brow between orbits (right half, 4·5), 9·0 in. Interval between sincipital ridges in line with ear, 2·5 in. Width of nasals in middle of anterior horn at base, 4·45 in. Width of nasals in line with echancrure, 4·25 in. Height from diasteme to edge of nasal arch, 3·9 in. Length from posterior angle (tuberosity) of right orbit to occipital crest, 11·4 in. Height of skull from right condyle to right occipital crest, 6·5 in. Width of occiput near the apex, 6·3 in. Vertical height, right orbit, 2·1 in. Diameter of ditto from post-orbitary process to anterior border (obliquely), 2·7 in. Height of septum from upper surface of incisives to nasal arch, at one inch from premolar, 2·5 in. From tips of nasals to suborbitary (posterior orbit) apophysis, about 15· in. Interval between inner borders of glenoid surfaces, 6· in. Width of zygomatic arches outside, in line with anterior boundary of temporal fossa, left, (end of last molar), 10·4 in. Width of ditto at middle, 11·5 in. Greatest width in line of glenoid surface, 12·2 in. Height of frontal chord at middle of frontal horn (chord stretches over apex of horn), 1·5 in. Height of frontal chord behind ditto, 2· in. Height between horns in middle, 1·8 in. Height in line with posterior boundary of temporal fossa, 1·1 in. Height of chord from middle of occipital crest to smooth surface at posterior boundary of front horn, at middle, 0·55 in. Height of chord from ditto to between horns, ·45 in. Height from ditto to behind the horn depressed (broken?) 1·3 in. Width of maxillary over last premolar, 6·7 in. Width of ditto at commencement of zygomatic arch, 9·7 in. Greatest width of zygomatic arches, 13·2 in. Greatest thickness of nasals to salient point of disc knob, 2·9 in. Medium thickness of ditto to base of conical knob, 2·15 in. Height of septum from tuberosity in front and below to edge of nasals, near tips, 3·3 in.

Lower Jaw (see Plate XXVII).—Entire length of jaw, from posterior margin of ascending ramus to symphysis, 19·25 in. Height of ascending ramus to top of coronoid, 10· in. Breadth of ascending ramus, 5·4 in. Length of line of molars (six last), 8·5 in. Length of three last molars, 4·9 in. Length of three premolars, 3·5 in. Length of last true molar, 1·55 in. Length of penultimate ditto, 1·6 in. Length of antepenultimate, 1·5 in.

Florence, 20th May, 1859.

The Florence Museum also contains a palate specimen of a young *Rhinoceros Etruscus*, showing on the right side the four milk molars emerged, of which the first three are very slightly affected by wear, the fourth is hardly emerged from the gum, and is in a state of germ. The second and third have each a small intercolumnar tubercle, but no basal *cingulum* sweeping round the inside of the barrels. On the left side there are only the first and second milk molars, with the anterior part of the third.

Dimensions.—Length of the four teeth, 5·7 in. Length of first, 1· in. Width of ditto, ·08 in. Length of second, 1·5 in. Greatest width of ditto, 1·3 in. Length of third, 1·8 in. Width of ditto, 1·6 in. Length of last, 1·9 in.

Another fine palate specimen in the same Museum is a little more advanced in age, showing on the left side the four milk molars, in place, and all more or less worn, together with the germ of the first true molar not out of the gum. On the right side there are only the last four of these teeth. The three anterior milk molars are worn nearly in the same degree; the first, being the least worn, shows three distinct fossettes; the second also shows three fossettes, the middle one of which is caused by the confluence of the 'crochet' with the outer combing plate. Both these teeth show an intercolumnar tubercle, and the crochet forms a very open angle with the hind barrel; the same is the case with the last milk molar, which shows no intercolumnar tubercle. None of these milk molars have any internal basal *cingulum*; the intercolumnar tubercle is most pronounced in the antepenultimate or second.

Dimensions.—Length of four milk molars, 5·8 in. Length of first, 1·1 in. Length of second, 1·5 in. Length of third, 1·7 in. Width of ditto in front, 1·7 in. Length of fourth, 1·9 in. Width of ditto in front, 1·7 in. Length of first true molar, 2· in.

All these specimens are labelled 'Rinoceronte a parete internasale, ou Rhinoceros tichorhinus, Cuvier.'[1]

IV.—Memorandum of Remains of Rhinoceros Etruscus, etc., in Museum at Pisa. (See also Plate XXV. figs. 5, 6, and 7.)

22nd May, 1859.

The cast of the skull of the Rhinoceros with the partial septum is not of *R. hemitœchus*,[2] but of the Val d'Arno species (*R. Etruscus*). The original, which has since been much mutilated, is still preserved in the Florentine Museum. The cast is wonderfully perfect in what concerns the septum, which is distinctly limited to the anterior half, and terminates in a thickened portion united to the incisive bone. (See Pl. XXVIII. fig. 1.)

The posterior part of the skull is wanting. On one side there are no teeth, but on the other the premolars and one molar remain. The teeth are worn low, but in the remaining molar the crochet is thick, and at somewhat of an acute angle. There is both a nasal and a frontal horn, and the nasal disc is very rugous. Saw also several lower jaws of Rhinoceros, some of them evidently of the '*R. Valdarnensis*.'[3] Another, much larger, and said by Prof. Meneghini to be from the Val d'Arno, is certainly of another species, and probably of *R. megarhinus*.

Pisa, 1st June, 1859.

Examined a very fine specimen of the right ramus of lower jaw of *Rhinoceros*. The six last molars are in place, and the posterior five are entire; the crown of the anterior molar is broken off. The ascending ramus is broken vertically through the sigmoid echancrure, so that the condyle and angle are missing, but the coronoid is perfect to the very apex, and compares beautifully in its greater dimensions, especially in breadth, with that of *Rhinoceros Etruscus*. The coronoid rises very vertically.[4] The teeth are all emerged and are very perfect; the cres-

[1] See *antea*, p. 314.—[Ed.]

[2] As stated in a previous note, and at page 332.—[Ed.] [3] *R. Etruscus*.—[Ed.]

[4] Dr. F. seemed to infer that this was the lower jaw of *R. megarhinus*. See page 356, line 13; and page 369, line 6.—[Ed.]

cents of the first true molar are still distinct; those of the last are but slightly affected by wear. The specimen was found in the Collines of St. Regolo.

Dimensions.—Total length of specimen, 15· in. Length of line of 6 molars, 9·6 in. Length of ditto of 3 premolars, 4·1 in. Length of 3 last molars, 5·7 in. Height of jaw under penultimate premolar, inner side, 3·2 in. Height of ditto under penultimate molar, inner side, 3·9 in. Height to apex of coronoid, 10·5 in. Width of apex of ditto, at sigmoid, 1·7 in.

V.—Note on a Specimen of Rhinoceros Etruscus, belonging to the Marchese Carlo Strozzi.

Leghorn, 2nd June, 1859.

This is a magnificent specimen of a symphysial portion of a lower jaw with part of the two rami. The rami are broken obliquely, so that only the fangs of two molars are seen in the section. The incisive border is obtusely bifid, with a very pronounced sinus above and behind each of the lobes. There is a narrow alveolar pit, as for an incisor that has dropped out. The symphysial portion is very carinate below, and is completely drilled by large mentary holes, nine on right side and seven on left. Seven of the nine holes on the right side are close together. This is an invaluable specimen.

Further Note on same Specimen—1860.

Mr. Dinkel's drawing is good (See Pl. XXVIII. figs. 2, 3, and 4). It shows on the right side the fangs of the anterior premolar, and of the next adjoining tooth. Mr. Dew's cast [1] is chiefly defective in the great size he has given to the incisive pits, especially on the left side, both in length and in antero-posterior diameter; the cast also makes them unsymmetrical, which they are not. Dinkel's drawing represents the pits accurately. They are evidently the pits of a small shed incisor.

Dimensions.—Extreme length of fragment, left side, 7·3 in. Length of diasteme, right side, 2·5 in. Length of symphysis, at middle, 4·3 in. Width of symphysis at middle of diasteme, 1·75 in. Greatest width of ditto at protuberances below, 1·85 in. Width of ditto at incisive pits, 1·4 in.

VI.—Description of Upper Jaw of Rhinoceros Etruscus, from Malaga.

The specimen consists of the greater part of a right upper maxillary bone, comprising *in situ* the second and third premolars, and the three true molars. The last premolar (p.m. 4) is wanting. The specimen has been fictitiously repaired with cement, placing all these teeth in series, without allowance for the missing premolar, and it is in consequence deceptive at first sight. The outer border of the crown is more or less damaged in most of the teeth. Together with Mr. Waterhouse, to whom I referred the fossil, I was at first led to believe that it belonged to the miocene *Aceratherium incisivum* of Kaup, from its close general resemblance to the specimen figured by De Blainville in the 'Ostéographie' (*Rhinoc.* Pl. XII.), under the name of *Rhinoceros incisivus d'Auvergne*. But I have since arrived at the conclusion, after a fresh examination of the Tuscan collections, that the Malaga Rhinoceros is the *Rhinoceros Etruscus*, so named by me from its prevalence in the Pliocene deposits of the Upper Val d'Arno. This form has hitherto been confounded, on the one hand with *Rhinoceros tichorhinus*, and on the other with *R. leptorhinus* of Cuvier. It had a bony nasal septum,

[1] Now in British Museum.—[Ed.]

DESCRIPTION OF PLATE XXVIII.

Rhinoceros Etruscus.

Fig. 1. Is a profile view of a cast of a skull of the Val d'Arno Rhinoceros in the Museum at Pisa, showing the septum distinctly limited to the anterior half of the nasal bones and terminating in a thickened portion united to the incisive bone. The figure is one-fourth of the natural size, and has been copied from a drawing executed for Dr. Falconer by Pierucci, artist at Pisa. (See page 359.)

Figs. 3, 4, and 5. Symphysial portion of the lower jaw, with part of the two rami belonging to the Marchese Carlo Strozzi, and described at page 360. The figures are one-half of the natural size, and have been reproduced from drawings by Mr. Dinkel. Fig. 2. Upper surface. Fig. 3. Under surface. Fig. 4. Lateral view.

Fig. 1.

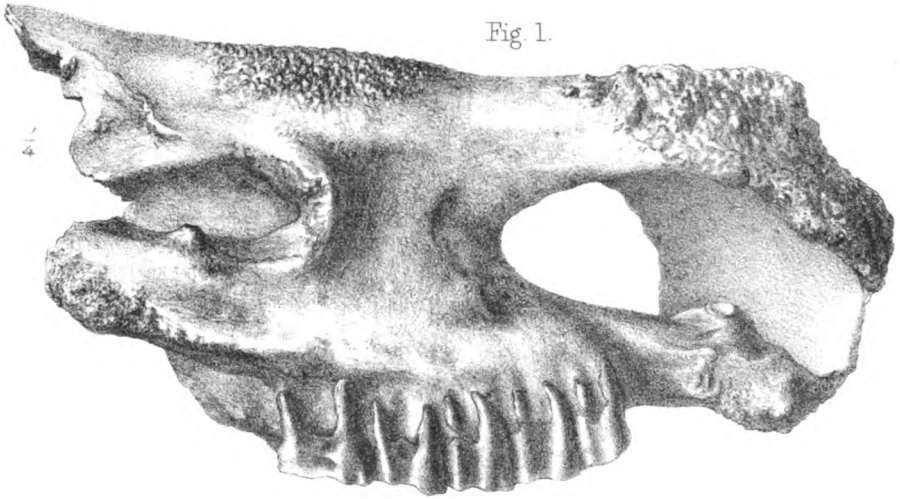


Fig. 2.

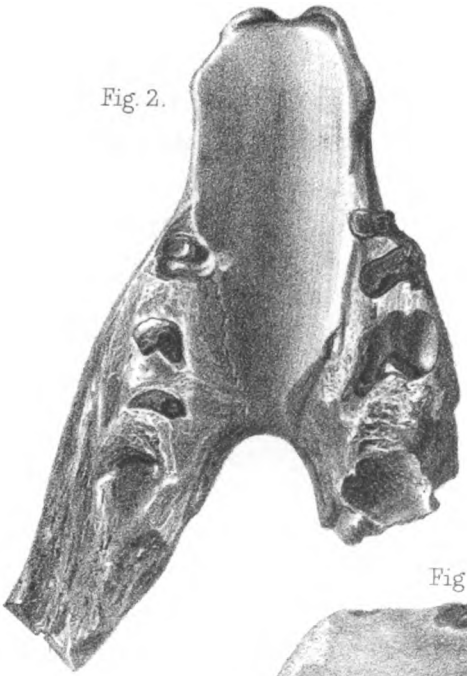


Fig. 3.

Fig. 4.

J. Dinkel & Etruscen del.

Rhinoceros Etruscus.

W. Westamp

as in the Clacton form, described in the 'British Fossil Mammalia,' under the designation of *Rhinoceros leptorhinus*, from which, however, it is essentially distinct in every detail throughout the construction of the skeleton.

The true *Rhinoceros leptorhinus* of Cuvier, founded upon the Cortesi cranium, had no ossified nasal septum, and is distinct alike from the species here called *Rhinoceros Etruscus*, and from the fossil Rhinoceros of Clacton. I have ascertained that the character of an ossified nasal septum was common to three European fossil species of Rhinoceros, of the Pliocene and newer Pliocene periods; and that there is only one known species of this category in which it was wanting. The characters of these species, and their distribution over the European area, will be described in detail in a separate essay.—H. F., *Oct.* 1859.

[The above description appeared as an appendix to a paper by Professor Ansted in the 'Quarterly Journ. Geol. Soc.,' for Feb. 1860. The maxilla with portions of vertebræ were found a few miles from Malaga in white marl, overlying Pliocene blue clay, abounding with shells. The following details of a comparison of the specimen with others in the British Museum is extracted from Dr. Falconer's Note-books.—Ed.]

British Museum, 16th August, 1859.

Brought with me to-day Ansted's specimen from Malaga, and compared it again with:—1. Kaup's *Acerath. incisiv.*, a cast of the old palate figured in the 'Oss. Foss. de Darmstadt;' 2. Kaup's cast of entire cranium of ditto; 3. De Blainville's *Rhinoc. incisiv.* of Auvergne, cast figured in 'Ostéogr.,' Pl. XII.; 4. Lartet's *Rhinoc. Simorrensis*; 5. Duvernoy's *Rhin. pleuroceros*, cast; and 6. Lartet's *Rhinoc. brachypus*, *Acerath. Goldfussi*—all *Aceratheria*.

Observed the following constant characters:—1. In *Acerath. Goldfussi*, the last molars even have a basal bourrelet all round, most strongly marked in the penultimate.

2. In all the *Aceratheria*, the base of the crown outside presents an angular bulge, a rudiment of what is seen in *Palæotherium*. This is very strongly marked in a beautiful specimen of Lartet's *Rhin. Simorrensis*, a skull with the palate and teeth on both sides (7 on left, only 6 on right); it is also very strongly marked in Lartet's *Acerath. brachypus*, the British Museum specimen of which is made up of teeth of different individuals. It is also well marked in the cast of Duvernoy's *Rhinoc. incisivus* of Auvergne, and very marked in the penultimate of Kaup's old palate specimen and in the skull cast.

3. The anterior outer vertical angle and groove are very boldly defined in all the *Aceratheria*, and the angular projection is very broad; but from that forwards the surface is nearly smooth, and without the undulated swelling seen in *Rh. megarhinus* and the *Rh. tichorhinus*, &c.

4. In Lartet's *Rhin. Simorrensis*, which is of an adult with all the teeth worn except the last, and is in the best stage of wear, besides the projection of the crochet from the back barrel, there is a constriction of the anterior barrel, which when worn forms a well-marked emargination, so that a lobe of the anterior barrel projects into the valley like a kind of anterior crochet; but overlapped by the true crochet, *i.e.* nearer the inside. The same thing is observed in the penultimate and antepenultimate of Kaup's cranium of *Aceratherium*, in his old palate specimen figured in the 'Oss. Foss. de Darmstadt,' and in De Blainville's Rhinoceros of Auvergne—*i.e.* in the last premolar and penul-

timate true molar. This anterior crochet survives when the true crochet is worn out; this is seen in De Blainville's drawing of the penultimate, which shows a kind of trefoil to the anterior disc.

5. In *Acerath. Goldfussi*, the posterior tubercle forms a long crenulated '*gradus*,' most salient at the outer end; the same is seen in Lartet's *R. Simorrensis* and in Kaup's *Aceratherium*. The ridge is confluent inside, free and high outside (like the bourrelet in the Mastodons.)

6. The mouth of the valley of the last molar is very open, and will admit the forefinger easily.

Compared the Malaga specimen, after making these observations, and remarked the following peculiarities:—

1. The last true molar behind has only a moderate tubercle, as in the Tuscan specimens, and has no 'gradus' ridge at base behind.

2. The mouth of the valley is comparatively narrow; in the last molar it will not admit the finger as in De Blainville's Auvergne specimen; the anterior barrel is broad and has a crochet constriction.

3. Unfortunately the apex of the outer ridge-summit of the crown is broken in the three last molars, but what remains of the low crown presents an undulated surface.

4. There is no true constriction of the anterior barrel, which in the antepenultimate is very broad.

5. There is a duck's bill pattern to the termination of the posterior valley, with an accessory plate forming a reniform outline, as in *Aceratherium*, but no subdivision of the crochet into plates in any of the teeth.

6. The most important and marked difference is that the second premolar (p.m. 2) has no disc of pressure in front—no p.m. 1! p.m. 3 has two fossettes and the anterior inner cone (barrel) is isolated all round by a deep fissure and gives a narrow ovate disc.

7. There is a basal bourrelet to p.m. 2 and 3, but not very marked.

8. The basal bourrelet to the premolars of the Auvergne specimen forms actually a sharp raised rim; the bourrelet is very little pronounced in comparison in the Malaga specimen, in which it does little more than make a bridge between the barrels, while in the Auvergne specimen it sweeps round the anterior barrel, rising obliquely in the posterior.

I infer the specimen to be of *Rhinoceros Etruscus*.

Dimensions.

	Ansted's specimen from Malaga	De Blainville's Auvergne palate
Joint length of three last molars	5·5	5·55
Joint length of 2nd and 3rd p.m.	2·9	2·8
Length, outer edge of p.m. 2	1·4	1·35
Width of ditto behind	1·55	1·6
Length of p.m. 3	1·6	1·5
Width of ditto, outer	2·	2·05
Length of t.m. 1 in middle	1·8	1·55
Greatest width in front	2·1	2·18
Length of t.m. 2, outer	2·15	2·1
Length of ditto, middle	1·9	1·85
Width in front at base	2·3	2·25
Length of t.m. 3, from tubercle to outer bourrelet	1·9	1·9

VII.—Description of Cranium with Teeth, Humerus, Tibia, and Fibula, in the Museo di Storia Naturale della R. Università, at Bologna.

13th May, 1861.

'Modello in gesso dell' intera regione palatina delle ossa mascellari, colla doppia serie dei molari quasi interi di un grande Rinoceronte fossile piuttosto giovine, e probabilmente della specie denominata dal Cuvier *Rhinoceros leptorhinus*. L'originale dal quale si è cavato questo modello fu trovato a poca distanza da Barberino del Mugello in quella stessa località dove furono rinvenuti gli altri denti e mandibule di Rinoceronte che si conservano nel Gabinetto sotto i no. 2,381, 3,450, 3,758, regulati dal veterinario di quel paese Signor Onorio Da Barberino. Vedi per il pezzo ora descritto la di lui lettera che si conserva nel museo sotto questo numero. La forma onde ottenere questo modello è stato levata dall' originale con tutta diligenza dal modellatore dei Gabinetti Anatomici dell' Università Signor Giuseppe Astorri.' [1]

Description of the original specimen in the Bologna Museum, to which the above memorandum applies.—Rhinoceros Etruscus, Pl. XXIX.

This specimen (represented in Pl. XXIX.) consists of the maxillaries on both sides, with part of the zygomatic arch of the left side, the palate, the palatine echancrure, with the entire series of molars on either side in the finest state of preservation. The cranial portion is broken off behind the palatine bones, and all of the facial part of the chaffron is broken on both sides in a line a little above the upper margin of the zygomatic arches; the lower boundary of the nasal echancrure to the bottom is perfect on the left side, and nearly so on the right. The left suborbitary foramen is distinctly shown; that on the right side is broken and concealed by an attached portion of distinct bone, enveloped in (*Sansino*) matrix. There remains in the front of the series of molars about $2\frac{1}{2}$ inches in length of the diastemal beak; but no indication of the descending portion of the nasal septum, the position of which is occupied by (*Sansino*) matrix.

The dentition, as regards the age of the molar teeth, is in the most perfect state to give the dental characters of the species; the antepenultimate true molar being but slightly worn, the penultimate less so, and the last true molar but very slightly affected by wear. Some of the crowns are more or less damaged, but what is wanting from this cause on one side is happily supplied on the other. The teeth belonged to an animal that was perfectly adult, but not aged; the three last premolars are beautifully seen on the left side; on the right there is most happily preserved the alveolus (triple) of the pre-antepenultimate premolar, which had dropped out, and the antepenultimate at its front edge shows distinctly the disc of pressure of the fallen tooth. It is therefore clear that there were seven molars in the adult state, viz. 4 premolars and 3 true molars. The following are the principal dimensions:—

[1] Il pezzo originale è stato poscia acquistato pel Gabinetto dal lodato Signor Da Barberino pel tenue prezzo di romani scudi quattro, e si conserva sotto questo stesso numero nel museo, dove fu depositato in Marzo del 1847, con altre ossa fossili scavate nella stessa località.

Extreme length of the line of 6 molars on the left side, measured from the base outside of the penultimate p.m. to the posterior boundary of the rudimentary pit at base of last molar, 9·1 in. Length of ditto on right side from anterior margin of alveolus of dropped first premolar to posterior boundary of last true molar, 9·5 in. Length of last three premolars, left side at top of crown, outside, 4·3 in. Length of three true molars to posterior boundary of last, left side, 5·4 in. Length from the antepenultimate p.m., right side, to the posterior margin penultimate true molar (to correspond with the Pisa cast), 7·7 in. Length of antepenultimate p.m. left side, top of crown outside, 1·35 in. Extreme width at base of ditto, behind, 1·6 in. Length of penultimate ditto ditto, left side, 1·55 in. Greatest width of ditto in front at base, 2· in. Length of last premolar in front at left side, 1·6 in. Greatest width of ditto in front at base, 2·1 in. Length of crown of penultimate true molar (1·95, right side), 2· in. Greatest width of ditto at base in front, right, 2·2 in. Length of crown of ditto at base inside, 1·5 in. Length of crown of penultimate true molar, right, outside, 2· in. Length of crown of ditto, inner side, at base, 1·5 in. Greatest width at base in front of ditto, 2·2 in. Antero-posterior diameter last true molar, left side, from anterior bourrelet, in front, to posterior boundary of basal valley behind, 1·8 in. Transverse diameter of ditto, in front, at base, 2·1 in. Interval between the anterior barrels of antepenultimate premolars, 2·05 in. Interval between anterior barrels of last premolar at base, 2·8 in. Interval between anterior barrels, first true molar, 3· in. Interval between anterior barrels of penultimate true molar, 2·1 in. Interval between anterior barrels of last molars, 2·85 in.

Memo.—The above dimensions give the width of the palate.

Length of diasteme in front of pre-antepenultimate premolar, right side, 1·75 in. Interval between the diastemal ridges in front of first premolar, 2·1 in. (These comprise the principal dimensions of the teeth.) Height of zygomatic arch, left side, 1·8 in. Width of zygomatic fossa, left side, 3·5 in.

Description of the Teeth on right side.—There were 4 premolars. This is distinctly shown on the right side by the triple fang-pits of the pre-antepenultimate or p.m. 1, viz. one in front and two separate ones behind: they are more or less filled up.

P.m. 2, the antepenultimate premolar, is quite entire on both sides, and in nearly the same stage of wear. The discs of the two inner barrels are distinct, and nearly of the same size; the anterior barrel does not form an isolated compressed cusp-shaped cone, as in Gervais' drawings of *R. leptorhinus*. The disc forms a very compressed oval, which is not confluent with the outer longitudinal disc. The disc of the posterior barrel is wider, and it is connected by an isthmus with the disc of the outer ridge, forming a kind of gourd-shaped outline. The disc of the outer longitudinal ridge is not much advanced in wear, being where broadest but 0·4. The posterior valley is nearly quadrangular in form and well defined, the posterior boundary being quite intact. The great middle valley forms a large triangular fissure, into which crochet processes are intruded from behind forwards. There is a distinct cingulum to the base at the inside, but not in strong relief, not so much so as the anterior talon. The outer surface of the crown is convex, antero-posteriorly.

P.m. 3, the penultimate premolar, right side. This tooth resembles in form the antepenultimate, but is larger and more advanced in wear. The discs of both barrels being confluent with the outer disc, it is much broader in front than behind. The anterior outer vertical furrow is well marked, the posterior valley is very much as in p.m. 2. The great middle valley forms a large fissure which is divided into two portions by the crochet processes, and an outer accessory plate is intruded from the longitudinal ridge; one little ring of enamel is isolated on the base of the crochet.

The penultimate premolar is equally perfect on both sides, and in the same stage of wear. They both show the basal bourrelet round the inner barrels, but not very pronounced.

P.m. 4, or the last premolar, has the anterior outer angle of the crown broken on the right side; it is beautifully perfect on the left, which shows the crown but very slightly advanced in wear; the discs of both barrels are confluent with the outer disc. The posterior valley is well defined and intact behind; the anterior transverse valley has intruded into it a large crochet process, and two large accessory plates (or combing processes), proceeding parallel to each other from the outer ridge, and converging towards the crochet. A distinct ring of enamel isolating a pit is situated on the base of the crochet, the whole causing a complex pattern to the convolutions of the transverse valley. Fine parallel and wavy grooved lines of enamel are beautifully shown on the inner surface of the enamel. This tooth, like the others, shows a distinct basal cingulum; it is more triangular in form than the two which precede it.

T.m. 1, the first true molar, is quite perfect on the right side; on the left side the posterior barrel is broken on its inner surface. The crown is more advanced in wear than any of the others, but still not very much so, being not yet half worn. The posterior valley is quite intact behind, but is narrower and more vertical than in the premolars. The transverse valley is divided into two nearly distinct portions by a very thick crochet, protruded from the posterior barrel; the outer division has no accessory plates intruded into the fissure from the outer longitudinal ridge; the inner division forms a narrow triangular fissure. The crochet is emitted at a very open angle from the posterior barrel, more open even than in *R. leptorhinus*, and totally different from that seen in *R. hemitœchus*. There is a little basal mammilla between the barrels at the inside, but not a trace of an anterior basal bourrelet to the anterior barrel. The teeth are very much alike on both sides. The central termination of the middle valley does not exhibit the duck's head pattern, figured by Gervais and De Christol in the teeth of *R. megarhinus*. There is a little tendency to the peculiar twist of the posterior barrel near the apex of the crown; the anterior outer vertical groove is broad, but shallow; the angle boldly overlaps the last premolar.

T.m. 2, or the penultimate, on the right side, is nearly perfect, but the outer anterior angle is broken off vertically on the left side. The tooth in general form resembles very much the antepenultimate just described, but is less advanced in wear; the crochet is also, as in it, emitted at an open angle. The transverse valley is divided in two by the crochet, the inner division being triangular, without any accessory plates or complication whatever. The summit of the posterior barrel has the peculiar compressed contortion well marked. The crochet advances nearly into contact with the anterior barrel; the discs form narrow bands of wear, which are confluent throughout. There is not a trace of a basal cingulum on either side.

T.m. 3, or the last true molar, is broken partly on both sides, but in different directions, so that what is wanting in the one is supplied by the other. The crown is but very slightly affected by wear on the right side. It is of a distinct triangular form, all the parts converging to a

contracted summit. The anterior barrel has a distinct basal bourrelet, which is wanting in the posterior. The transverse valley is divided into two parts by a crochet, advancing on the right side to meet an accessory plate emitted from the anterior barrel. On the left side, these two plates overlap. On the right side, an accessory plate is also given off from the outer ridge, converging towards the crochet. The most striking character about the tooth is, that, as in *R. hemitœchus*, there is a distant rudiment of a posterior valley restricted to the base, but not forming a well-defined cup with a distinct rim, as in that species. This rudiment is distinctly shown on both sides, bounded posteriorly by a basal cingulum. The basal bourrelet behind the posterior barrel of the last true molar has barely emerged above the alveolar margin.

The enamel is smooth in all these teeth, and marked by beautiful, fine, wavy, horizontal lines. There is not a trace of general superficial rugosity, and not the slightest indication of a layer of cement.

The outer surface of the enamel is traversed in a dendritic fashion, by fine channels, like those which are attributed to the work of Marine Sponges, but the formation out of which this specimen came is fresh water.

The bottom of the palatine echancrure comes in a line with the middle of the posterior barrel of the penultimate true molar, and the suborbitary foramen is immediately over the line of junction between the penultimate and last premolars. The disc of the crochet of the penultimate true molar is nearly as broad as that of the posterior barrel, the crochet being very thick and simple. The anterior outer vertical furrow is well pronounced in all the molars, from the penultimate premolar to the last true molar inclusive. It is wide and shallow, but the other vertical hollows are but very slightly pronounced by an undulation of the surface. There is not the slightest indication of an outer basal bourrelet, as seen in the *Aceratherium incisivum* of Kaup, the outer surface being smooth, and nearly vertical throughout.

Besides the above, there are casts in the Bologna Museum of several of the principal specimens of Rhinoceros figured by Nesti, and a duplicate cast of the Targioni Tazzetti cranium of the Florence Museum, made by Savi for Pisa, and of which I got drawings. There are also casts of the following bones:—A humerus, left side, very closely resembling the figs. 1 and 2 of Cuvier's Pl. X. *Rhin.*, but more perfect, of which the following are the dimensions:—

Extreme length from top of tuberosity to tuberosity of outer condyle, 16·25 in. From articulating head to middle of inner condyle, 14· in. Width of articular surface of condyles, 3·4 in. Greatest width at inferior end, 5·2 in. Antero-posterior diameter of inner condyle, 4·1 in. Greatest width of shaft at middle of median tuberosity, 5·1 in. From sinus, at lower margin of middle tuberosity, to top of great tuberosity, 7·2 in. Greatest constriction of shaft, below middle tuberosity, 2·2 in. Antero-posterior diameter of articular head and tuberosity, 4· in. Transverse diameter of articular head, about 3·7 in.

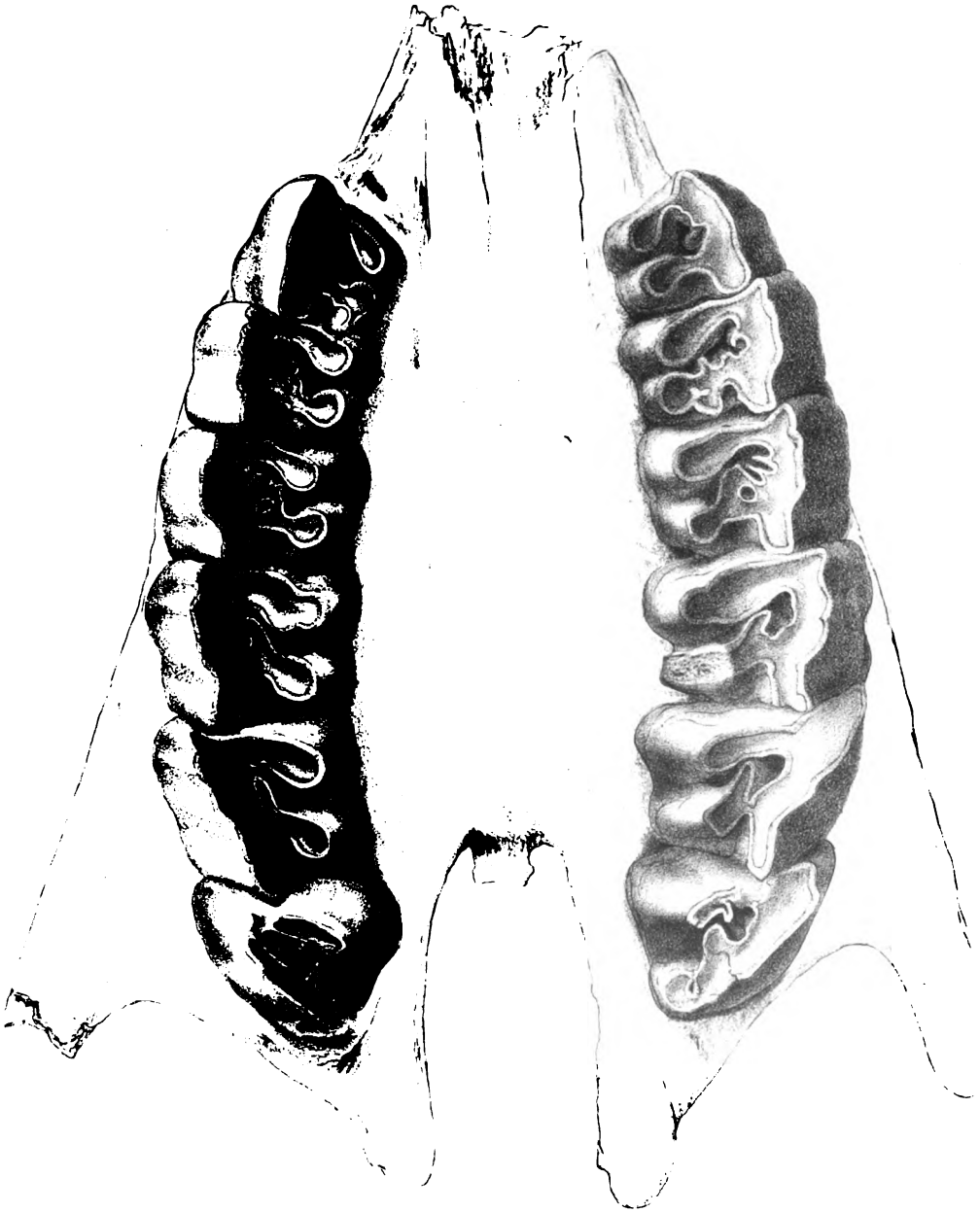
Specimen of tibia and fibula, figured by Cuvier, Pl. XI., *Rhin.*, fig. 15.

Extreme length of tibia at middle, about 14· in. Transverse diameter of upper articulating surface, 4·4 in. Antero-posterior ditto to inner margin of inner articular surface, 4·8 in. Transverse diameter, lower articular head, including fibula, 4·3 in. Antero-posterior diameter, inner articular cup, lower end of tibia, 2·8 in. Extreme length of fibula, 12·25 in. Transverse diameter of shaft of tibia, at middle, 2·3 in.

DESCRIPTION OF PLATE XXIX.

Rhinoceros Etruscus.

This Plate represents the palate view of the cranium in the University Museum of Natural History at Bologna, described at page 363. The drawing is one-half of the natural size, and has been copied from one which Dr. Falconer had executed at Bologna, and on which he had inscribed '*Rhinoceros Etruscus*, Museum, Bologna.' A cast of the specimen which Dr. Falconer also brought from Bologna has been deposited in the British Museum.



J. Forbes Del.

Rhinoceros Etruscus.
(Bologna)

W. West imp.

Cast of right femur, figured by Cuvier, Pl. XI. *Rhin.*, fig. 19, of which the upper articulating head is wanting

Extreme length taken at the middle, 16·50 in. Antero-posterior diameter of inner condyle and pulley, the latter partly broken, 6· in. Length of pulley in middle, 2·5 in. Transverse diameter of ditto, 2·5 in. Least transverse diameter of shaft below the middle trochanter, 2·5 in. Vertical height of neck of middle trochanter, 2·1 in. Transverse diameter of shaft, including middle trochanter, at middle of ditto, 5·2 in. Width of bone at middle of sinus above middle trochanter, 4·1 in.

All these bones belong to *Rhinoceros Etruscus*, and there are still preserved in the Bologna Museum, the originals of the specimens represented by Cuvier, figs. 5 to 10, inclusive of Pl. X., *Rhin.*, of 'Os. Fossil.' These are the upper and lower extremities of a humerus of the same species (*R. Etruscus*), stated to have been procured by the Ab. Ranzani in France.

VIII.—Description of Specimens of Rhinoceros Etruscus at Le Puy.

Le Puy, 15th September, 1863.

In the Museum of Le Puy there is a magnificent series of remains of the skeleton, consisting of three feet, with all the bones *en suite* to the terminal phalanges—the tibia, fibula, astragalus, and articular head of the femur. The shaft of the femur with the third trochanter is exactly as in Pentland's specimen in the British Museum. There are also two detached calcanea, both of the left side, and one astragalus. All are from Solilhac.

In the same Museum there is also a series of the molars of *R. Etruscus*, six right and left, but detached and separate, with the last molar just coming into use, and in the finest condition for figuring. They are from Vialette. In addition there is a superb specimen of the left ramus of the lower jaw of *R. Etruscus*, having the four last molars *en suite*, all a little worn, and the hind portion of the penultimate premolar; the teeth are in a beautiful condition to be drawn.

There is also the muzzle of the lower jaw of *R. Etruscus*, perforated below exactly like the specimen of Carlo Strozzi (see page 360), and with the empty pits of two small median incisors more round, more pronounced and less angular than in Strozzi's. There is no keel below, as in the Florence specimen. The specimen is red, heavy and ferruginous, and in the same mineral condition as the Vialette lower jaw.

Dimensions of Lower Jaw, left, from Vialette.—Length of fragment, 11·5 in. Length of series of four molars, 6·75 in. Length of last true molar, 1·75 in. Length of penultimate, 1·65 in. Length of antepenultimate, 1·62 in. Length of last premolar, 1·50 in. Height of jaw at posterior edge, last molar, 3·35 in. Height at anterior edge of first true molar, 2·9 in. Height at anterior edge of last premolar, 2·65 in.

The inferior border is perfectly straight along the three true molars; there is no curve, but there is a strong longitudinal channel along the middle of the inner side; and to each of the anterior barrels of the four molars there is an oblique descending bourrelet, strongly marked. The jaw is truncated along the ascending ramus and in front. The specimen ought to be figured.

15th September, 1863.

Masel, near Le Puy, with Messieurs Pichot, Robert, and Lartet. Jaw of *Rhinoceros Etruscus* found by M. Pichot at Sainxelle, near St. Aune.

There is also a magnificent head, very well preserved, of *Rh. Etruscus*, with the series of molars (six) of the two sides present. The anterior portion is entire, and also the bony wall of the nasal partition. The two jaws are slightly broken, and likewise the orbit of the left side. The occipital portion, as well as the condyle, is wanting. The age of the dentition is that which best shows all the characters, the last true molar being very little worn. The three premolars are much affected by wear. The antepenultimate has three fossettes; the echancrure of the first anterior ridge is still apparent, as in the drawing of the Bologna skull (Pl. XXIX.). The penultimate is less worn and has two fossettes, the middle one being divided into two parts; and the crochet is serrated, as in the Bologna jaw. The last premolar of the left side is well worn, and shows three very distinct fossettes, and the crochet is but little denticulated. The first true molar is half worn, the crochet is simple and at right angles, without a combing plate; the median hollow is quite open on the inner side. The penultimate true molar has nearly the same form, but on the left side the crochet is confluent with the anterior ridge, so as to isolate one part of the median hollow which is situated behind, as in the tooth of Crozes; but on the right side the crochet is detached. The last molar is very little worn, with the crochet free, and a plate projecting from the anterior ridge. In form and size it perfectly resembles the cast that I have brought from the Museum at Pisa (Pl. XXV. fig. 5), and the molars (pre- and true-molars) have a basal crown on the inner side. The length of the series of six molars is nearly the same as that in the drawing of the Bologna skull (9·8 in.). The osseous partition and the nasal bones exactly resemble the drawings of the specimens in the Florence Museum, but it seems to both M. Lartet and myself that the osseous partition is less complete.

The jaw is embedded on the left side in tufaceous greenish grey alluvium—the 'Alluv. inter-volcanique' de M. Pichot.

III. NOTES ON RHINOCEROS LEPTORHINUS (Cuv. pro. parte), R. MEGARHINUS (Christol).

I.—Description of Remains of Rhinoceros Leptorhinus (R. megarhinus) in the Museum at Montpellier.

18*th November*, 1858.

Examined the original of the fine lower jaw of *R. megarhinus* figured by Gervais, and also another lower jaw of the same species more perfect at the muzzle, but mutilated behind. The former is double, and on the right side comprises the whole of the ramus from the tip of the incisive margin on to the condyle and coronoid, the apex of the coronoid being alone wanting. On comparing it with Dinkel's drawings of *R. hemitœchus*, observed the following points of difference (See Pl. XXX.):—

1. The lower edge of the horizontal ramus is nearly a straight line from the angle on to the anterior edge of the first true molar.
2. The low elevation and great thickness of the body of the ramus.
3. The horizontal line (still slightly concave) of the plane of dentrition (very concave in *R. hemitœchus*).

DESCRIPTION OF PLATE XXX.

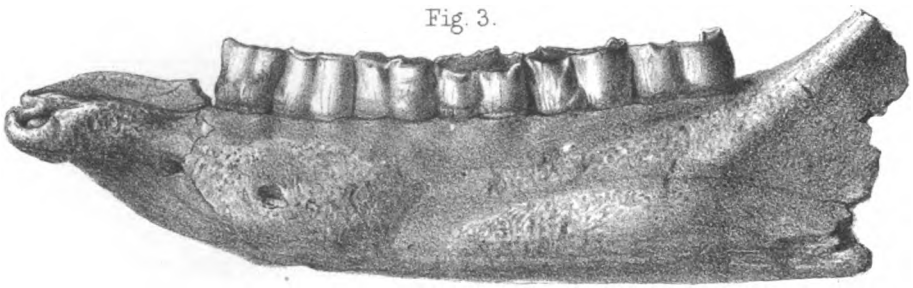
RHINOCEROS LEPTORHINUS (R. MEGARHINUS).

Three different views of lower jaw, one-fourth of the natural size. Fig. 1. Inner surface. Fig. 2. Shows crowns of molars and symphysial spout. Fig. 3. Outer surface. These drawings have been executed by Mr. Dinkel from a cast brought by Dr. Falconer from Montpellier, labelled 'Rhinoceros des Sables de Montpellier,' and now deposited in the British Museum. (See page 368.)

Fig. 1.

Fig. 2.

Fig. 3.



J. Dinkel del. et lith. Rhinoceros leptorhinus (R. megarhinus.) W. West imp.

4. The great length of the diasteme; the distance from the middle of the incisive border to the anterior edge of the antepenultimate premolar being exactly equal.

5. The absence of reclination in the anterior border of the coronoid. It makes an open curve below with the ramus, but the superior part is nearly vertical.

6. The posterior angle projects behind the neck of the condyle, and is puckered. (The figs. in 5 and 6 of De Christol's thesis very good; his *R. tichorhinus*.)

7. Very long diasteme with sharp raised edges and great constriction of the gutter between them, and then a spathulate expansion in front towards the incisive border; the anterior portion is curved, and throws out a step, but the form is very different from *R. hemitœchus*, and there is nothing of the scaphoid character in the general contour below.

Dimensions.

	R. megar. No. 2	Col. Wood's R. hemitœchus
Length of 6 last teeth	10·5	10·
Length of 3 (last) true molars . . .	6·	6·25
Length of 3 premolars	4·5	3·8
Length of diasteme to incisive border . .	4·4	

In both of Gervais' specimens the teeth are adult: *i.e.* the last are partly worn and the antepenultimate true molar is ground down to a disc. In jaw No. 2, the larger, there are only six teeth (less perfect in the other). In No. 2 there is also a very distinct outer included incisor on the right side, with the alveoli of two middle ones nearly filled up.[1]

II.—Measurements of Skull of Rhinoceros Leptorhinus in the Museum at Lyons.

[On his way to Italy, in 1858, Dr. Falconer was presented by Prof. Jourdan with the cast and an unpublished lithographic engraving of a skull of Rhinoceros in the Nat. History Museum at Lyons, with the following inscription: 'Tête de Rhinoceros megarhinus des sables d'eau douce trouvée par M. Jourdan le 12me Févr. 1856, à Lens Létang, près Moras, Drôme.' This cast was subsequently compared with the Rhinoceros remains in the various museums of Italy, in the descriptions of which it is frequently referred to. There is no description of the skull in Dr. Falconer's Note-books, but the skull and molar series have been reproduced by Mr. Dinkel in Pl. XXXI. figs. 2 and 3, and I am indebted to Mr. W. H. Flower, F.R.S., for his assistance in taking the following measurements of the cast, which is now deposited in the British Museum.—Ed.]

1. Extreme length of skull from summit of occipital crest to point of premaxillary bones, 25·5 in. 2. Extreme length of ditto from posterior plane of occipital condyles to broken edge of left diasteme, 23·3 in. 3. Extreme length of ditto to anterior edge of alveolus of 2nd premolar, 22·4 in. 4. Length from anterior border of right orbit to outer edge of occipital plane, left side, 15·2 in.

[1] Dr. Falconer's Note-book also contains a description of a mutilated skull of *R. megarhinus* (*sic*) in the Bishop's Palace at Montpellier, examined by him on Nov. 21st, 1858. Nearly the whole of the nasal sinus was filled with pebbles and gravel, so that it was impossible to be certain whether or not there was a septum, but Dr. F. was inclined to agree with De Christol and Gervais in thinking there was none.—[Ed.]

5. Length from posterior plane of occipital condyles to posterior margin of last true molar, 12·5 in. 6. Diameter between outer margins of occipital condyles, 4·5 in. 7. Transverse diameter of left condyle, taken near middle, 1·5 in. 8. Vertical height of ditto, 2·9 in. 9. Diagonal diameter of ditto (greatest), 3· in. 10. Greatest width of occipital foramen, 1·7 in. 11. Height of occipital plane to lower surface of occipital condyles, 9·5 in. 12. Greatest width of occipital plane, just above the condyles, 6· in. 13. Greatest width of ditto about middle, 5·2 in. 14. Length of zygomatic fossa, left side, 7·4 in. 15. Length from posterior boundary of zygomatic fossa to posterior surface of left occipital condyle, 7· in. 16. Length from anterior margin of auditory foramen to anterior margin of the orbit, 10·5 in. 17. Extreme length from anterior margin of 2nd premolar to posterior edge of last true molar, left side, 10·5 in. 18. Length of last 3 premolars, left side, 4·7 in. 19. Length of 3 true molars, left side, 6·2 in. 20. Extreme length of 1st and 2nd true molars, left side, 4·25 in. 21. Length of 2nd premolar, left side, 1·55 in. 22. Transverse diameter of ditto near base, behind, 1·7 in. 23. Antero-posterior diameter of 3rd premolar, left side, 1·6 in. 24. Transverse diameter of ditto at base, anterior barrel, 2· in. 25. Antero-posterior diameter of last premolar, outer surface, 1·7 in. 26. Transverse diameter of ditto at base, anterior barrel, 2·25 in. 27. Length of crown of first true molar, outer surface, left, 2· in. 28. Transverse diam. of ditto at base, anterior barrel, 2·6 in. 29. Antero-posterior diameter of penultimate molar, anterior surface, 2·3 in. 30. Transverse diameter of ditto anteriorly, 2·5 in. 31. Antero-posterior diameter of last true molar (greatest), 2·1 in. 32. Transverse diameter of ditto anteriorly, 2·4 in. 33. Interval between diastemal ridges at 2nd premolar (inner surface), 1·2 in.

III.—Note on Rhinoceros Leptorhinus from Ilford.

British Museum, 13th August, 1859.

Compared the cast from Montpellier of the last upper true molar with a specimen labelled 'Tooth of Rhinoceros from Ilford, Essex' (No. 40,482). They are both nearly of the same size and stage of wear and exhibit exactly the same pattern. The Ilford tooth shows still a kind of vertical cleft for the posterior valley, and a very thick layer of cement in the valley.

IV.—Note on Molars of Rhinoceros Leptorhinus? from the Bone Breccia of Nice, filling a Cavern in the Jura Limestone.

Nice Museum, 11th December, 1858.

Of the Rhinoceros the finest specimen is a sixth or penultimate upper molar of the *left*[1] side (Pl. XXXII. fig. 3), but very slightly advanced in wear; unluckily the anterior outer angle is broken off, as far as the middle of the great valley; but the tooth shows in section the step of the anterior external vertical groove very pronounced, the whole of the great middle valley, the anterior basal bourrelet, the posterior valley sheeted over with a very thick layer of cement, the anterior and posterior barrels inside entire to the apex, and the crochet quite entire. The enamel is rugous on the outer surface, with vertical striæ, but hardly so much so as ordinarily seen in *R. tichorhinus*, and the enamel is not so thick. Both the anterior and posterior barrels are very much compressed at the apex, as shown in the drawing, and the crochet is also much compressed, and given off forwards at a very open angle with the crown of the posterior barrel. The direction of the crochet deviates but little from a straight line; but the crochet does not join on to the anterior barrel as in *R. tichorhinus*, a point of great

[1] Left, not right, as identified by Gastaldi.

DESCRIPTION OF PLATE XXXI.

RHINOCEROS LEPTORHINUS (R. MEGARHINUS).

Fig. 1. Series of six molars of upper jaw, right side, described at page 395. The figure is one-half of the natural size, and has been reproduced from a drawing found in Dr. Falconer's collection, and on which he had inscribed, '*Rhinoceros leptorhinus*, *R. megarhinus*, Christol, from specimen in Municipal Museum of Imola. Scarabelli.'

Fig. 2. Series of six molars of upper jaw, left side, one-half of the natural size, copied from a lithograph found in Dr. Falconer's collection, and on which he had written: 'Unpublished lithograph of skull of fossil Rhinoceros belonging to the Lyons Museum, for a work by Professor Jourdan of Lyons. *Rhinoceros leptorhinus*, Cuv., *pro parte*, *R. megarhinus*, Christol.' The artist has improved on the original drawing by the assistance of a cast of the same skull presented to Dr. Falconer by Professor Jourdan, and which is now deposited in the British Museum. (See page 369.)

Fig. 3. Represents the cranium of *R. leptorhinus*, referred to under fig. 2, one-seventh of the natural size. The drawing has been executed from the same materials as fig. 2. As in the case of the Cortesi cranium, the specimen is somewhat distorted from crushing. (See pages 369 & 381.)

Fig. 1.

Fig. 2.

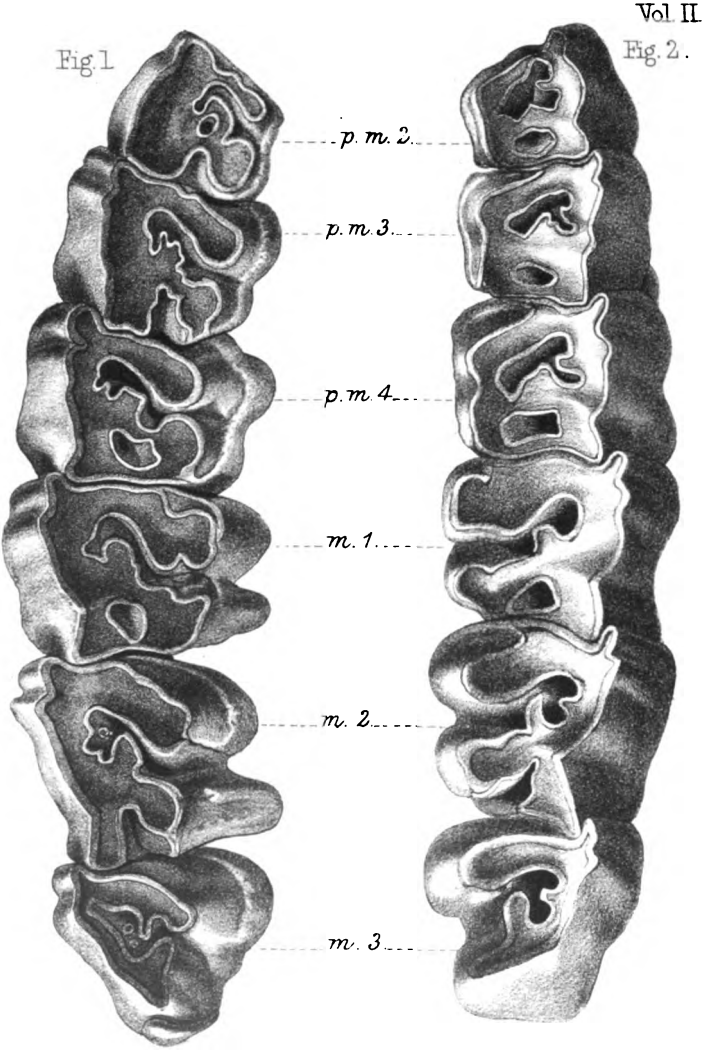
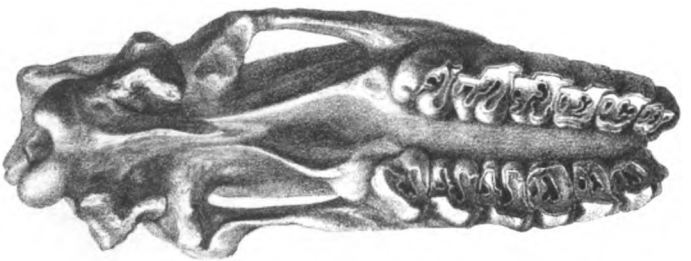


Fig. 3.



J. Dinkel del et lith.

W. West imp

Rhinoceros leptorhinus (Cuv.) R. megarhinus (Christol)
(1, Imola; 2, 3. Lyons.)

importance. The termination of the middle valley is angular (as in the sketch) and there is a very pronounced combing process, emitted from the outer side, and projected across so as to terminate not far from the end of the crochet. The projection of this plate is much more considerable than is shown in the drawing, and agrees very much with that of *R. megarhinus* in Jourdan's big drawing (Pl. XXXII. fig. 2), with the allowance for the latter being more advanced in wear. The posterior valley is very deep, down to the very bottom of the crown. It is large and lined with a very thick coat of cement. The general contour of the crown of the tooth is not prismatic, as in *R. tichorhinus*. The opposite sides (inner and outer) converge towards each other quite as much as in *R. hemitœchus* or *R. megarhinus*, but the crochet forms a much larger plate than in the latter. The anterior outer vertical groove is very angular and pronounced, forming a well-marked narrow step, where seen in the section. No basilar mammilla on the inside between the barrels. The posterior barrel is narrowed inside, into a kind of oblique vertical keel, not round and bulging as in the drawing. Besides the large combing process, the posterior termination of the transverse valley throws up from below a pillar, which is not laterally attached. It is represented by the posterior vallicular mammilla in the figure. The anterior bourrelet is very pronounced and *gaping*, *i.e.* the interspace is well marked.

The most peculiar character probably consists in the form of the 'barrels.' The posterior barrel is constricted about half way up.

Dimensions.—Length of outer surface, 2·3 in. Length at middle along crochet to outer edge of posterior valley, 2· in. Length, inner side, near base, 1·6 in. Greatest transverse diameter at base, 2·5 in. Greatest transverse diameter near top where broken, 1·4 in. Greatest transverse diameter of posterior division (base), 1·9 in. Greatest transverse diameter of ditto at top, ·8 in. The two last measurements show the amount of convergence.

[In Dr. Falconer's Note-book a description is given of two other molars of Rhinoceros in the Nice Museum:—No. 39, a third premolar, and No. 40, a fragment of the first true molar, left side. Respecting the latter it is stated 'there is no indication that the crochet was joined on to the anterior barrel, so as to form during wear a third pit or well, as in *R. tichorhinus*. This confirms the indication of the sixth molar described above. Further, there is not a vestige of a basal bourrelet, although the barrels are not ground so low down as to have caused its disappearance.'—Ed.]

V.—Description of Remains of R. Leptorhinus in the Museum at Rome.

April and May, 1859.

A. *In Professor Ponzi's Collection from the Gravel Beds of Ponte Molle.*

The Rhinoceros remains are much rarer than those of Elephant. The only specimens are:—

1. Two last true molars, upper jaw, left side. (Plate XXXII. fig. 6.)
2. A penultimate upper premolar, left side, much worn.
3. A finely preserved left upper milk molar. (Plate XXXII. fig. 7.)

4. A fragment of a left lower jaw with the penultimate and antepenultimate true molars.

Of the last true molars, the best preserved, A, (Pl. XXXII. fig. 6), resembles very much in form, size, and amount of wear, the specimen of *R. megarhinus*, which I got from Gervais, from the marine sands of Montpellier. It is deficient only at the outer angle, where the grooved portion is broken off by a fracture sloping from the inside outwards. The crown presents the characteristic V-shaped outline. The posterior barrel is somewhat compressed, and at the posterior inner angle (where the rudimentary valley of *R. hemitœchus* is seen), there is a broad adpressed basal tubercle with an obscurely crenated edge, very considerably larger than the tubercle on the Montpellier cast (Pl. XXXI. fig. 2). This tubercle leaves a neck between it and the enamel of the crown, filled up with cement; but there is nothing resembling the *pit* in *R. hemitœchus*; and there is no decurrent groove ascending from it. The principal differences between it and the Montpellier specimen are: 1st, that the valley is more open, with a wider fissure, from more advanced wear, and that there are no remains of the crochet process intruding into the valley (only a sinuous line), nor of a combing plate from the outer angle causing the 'duck's head' pattern of the Montpellier crown, which is seen also in Gervais' drawings. The termination of the valley forms a large oval fossa, which contracts into the fissure, that opens between the barrels. 2nd, that there is a basal tubercle between the barrels, appended to the posterior barrel. 3rd, that there is a well-marked layer of cement, which is abundant in the valley near the intercolumnar tubercle.

The second specimen, B, is nearly in the same stage of wear, but it is mutilated by a fracture, which has removed a portion of the inner side of the last barrel, while the outer angle, mutilated in A., is entire. It corresponds very exactly in form with the other. The posterior barrel shows the same kind of tubercle, adpressed and near the base, but the greater part of it is removed by the fracture. The transverse valley is more contracted in consequence of part of the crochet remaining. The termination is triangular, and a good deal like *Gervais'* fig. 6,[1] but is more triangular and has less of the 'duck's bill' pattern. This specimen very fortunately presents the outer angle entire. It resembles the Montpellier cast exactly in form, *i.e.* it is broad and salient, with a well pronounced vertical groove, and the lobes of the emargination subequal, being very different in form from the *R. hemitœchus* molar; where the angle is narrow, the groove shallow, the lobes unequal, the anterior being much the higher. There is no intercolumnar tubercle in B., but the barrel is broken at that point.

From the annexed comparative measurements, I am satisfied that these Roman specimens, including Lyell's *Ponte Molle* specimen, are of the same species, as the Montpellier one, *i.e. R. megarhinus* of Christol. Lyell's specimen shows much cement at the mouth of the valley, but the outer angle of the chevron is mutilated and rolled, and the posterior barrel is rolled below where the posterior basal tubercle is placed. The enamel in all is thin and smooth.

[1] Paléontologie Française, Pl. ii.—[Ed.]

Comparative Dimensions.

	Cast of Montpellier specimen	Ponte Molle, Lyell's *	Ponzi's, No. A.	Ponzi's, No. B.
Antero-posterior diameter of barrels, inner side, at base	In. 2·15	In. 2·1	In. 2·1	In. 2·
Transverse ditto from base, outer angle, to anterior border	2·4	2·4	2·3	2·2
From ditto to posterior barrel . .	2·3	2·6 (adding enamel)	2·6	2·3 nearly, but broken
Width of outer angle at apex . .	·65	broken	broken	·6 nearly

* Lyell's specimen partly mutilated.

The next specimen is a third upper premolar, left side, the crown worn very low down, so that the basal bourrelet is removed. The posterior valley is reduced to a '*round* pit,' and the central valley to an isolated fissure, somewhat uniform in outline.

Dimensions.—Width of crown, 1·8 in. Length outer side, 1·45 in. Length inner ditto, 1·2 in.

N.B. In general form this specimen resembles a good deal (fig 1 of Pl. LI.[1]) of the 'Ossemens Fossiles,' which is of the opposite side. In the latter, which is of *R. tichorhinus*, and much worn, the posterior fossette is much larger in proportion to the transverse fossette, and is less round.

The milk molar (Pl. XXXII. fig. 7) is in the finest state of preservation; it has no fangs; the crown is in the best stage of wear to show all the characters. The angle formed by the crochet is very open, in consequence of the obliquity of the disc of the posterior barrel; there is no basal bourrelet, but a rudimentary intercolumnar tubercle. The groove of the external angle is deeply marked and broad, and the posterior niche is also broad and well marked, overlapping the next tooth. The crochet is undivided, and the outer ridge throws off a large solitary combing plate, which is directed parallel to the anterior end of the crown, and at right angles to the crochet, which it nearly touches. The barrels are as fully developed as in a true molar, and but for the small size the tooth would be fixed to be a fourth or last milk molar. The outer vertical groove is very deep, and its posterior bounding ridge very high and strongly developed. The posterior valley forms a gaping triangular fissure, with shelving sides. It is of large size, the posterior edge intact, and emarginate, so as to form a bi-lobed edge like the carnassier tooth of a tiger. The transverse valley is very open at its mouth, forming a triangular fissure. It is then bent gently forwards, to terminate in the *cul de sac*. There is a small intercolumnar tubercle, but not a trace of a basal bourrelet inside. The thick 'combing plate' is almost in contact with the point of the crochet. If they had run together a third fossette would have been formed, as in the premolar. The opening of the transverse valley is gaping, and the posterior barrel

[1] Pl. xiii. fig. 1 of *Rhin.* 3rd edit.?—[Ed.]

is compressed with the peculiar torsion of *R. megarhinus*. It is deeply grooved at the anterior side. The disc of wear points diagonally backwards. (This specimen was named *R. leptorhinus* by Prof. Owen.)

Dimensions.—Length of crown, outer surface near top, 1·8 in. Length of ditto in middle, 1·55 in. Length of ditto, inner side near base of barrels, 1·1 in. Length of outer surface near base, 1·5 in. Transverse diam. anter. end, 1·7 in. Transverse diam. posterior end, 1·6 in.

The lower jaw specimen is a mutilated fragment of the alveolar portion of the left ramus broken off at one-third of its height. It comprises the antepenultimate and penultimate true molar in place, and the anterior half of the socket of the last true molar behind. The antepenultimate is worn in front down to the line of commencement of the outer anterior oblique bourrelet, and has the discs confluent, but the posterior crescent is not much worn, less so than in the penultimate of the Montpellier cast. The anterior end bears a disc of pressure. The penultimate has the apices in the first stage of wear; the disc of the posterior crescent is distinct from, and at a lower level than, the anterior. The posterior end bears a well-marked pressure surface.

Dimensions.

	Montpellier Cast		Roman Specimens	
	Antepenlt.	Penult.	Antepenlt.	Penult.
Length of crown at top . . .	1·7	1·85	1·9	2·
Width in front	1·05	1·1	1·4	1·45
Greatest ditto behind	1·2	1.15	1·45	1·5
United length of the two crowns .	3·5		4·	

Compared with the *R. megarhinus* cast, they agree in form and proportions, but are much smaller. They have each the same oblique bourrelet ridge to each barrel (one in front of the tooth, the other behind) on the outer surface. There is a very thick coat of cement below. They differ entirely from the square form and thick enamel of *R. tichorhinus*, with two detached molars of which from Kent's Hole I compared them. I was not able to extend the comparison to *R. hemitœchus*, but I believe them to be of *R. megarhinus*. The specimen is from Ponte Molle (Professor Ponzi's 'volcanic sand').

B. *In the Sapienza Museum, from Monte Sacro.*

Examined a very fine penultimate true molar, upper jaw, left side (No. 111) of a fossil Rhinoceros from Monte Sacro, showing all the characters in the best condition of wear; both the collines and crochet are worn, but the posterior edge of the hind valley is intact (Pl. XXXII. fig. 4). The tooth is of very large size, larger than the detached tooth of *R. hemitœchus*, with which it was compared.

Dimensions.

	Roman Inches	R. hemitœchus Inches
Extreme length of crown, outer surface . . .	2·5	2·35
Ditto, inner side	1·85	2·
Transverse diameter in front, at base of enamel .	2·7	2·35
Ditto ditto, behind	2·2	2·
Height of crown anteriorly, outer surface . . .	2·2	1·7
Ditto ditto, inner	1·3	0·9

From these dimensions it is seen to be larger than the *R. hemitœchus* tooth, and less advanced in wear. In this respect it closely resembles De Christol's figure of *R. megarhinus*.

Compared with *R. hemitœchus* there are the following differences:— The crochet forms a very open angle with the posterior colline; it is longer and narrows towards the point. The termination of the valley throws out from the outer ridge a thick combing plate, which is directed at right angles to the crochet, and divides the *cul de sac* into two compartments, as in the milk molar in Ponzi's collection. The posterior colline is directed backwards, and has the peculiar torsion shown in De Christol's figure. Further, the anterior overlapping sinus is much more pronounced, and the anterior outer vertical groove is wider and deeper. The enamel is smooth, with some cement on the outer side, but the greater part is removed. There are some denticles in the bottom of the valley, but these have been broken in picking out the matrix of gravel.

This tooth agrees in every respect with *R. megarhinus*, and proves that species to exist in Italy. It has no inside bourrelet, nor intercolumnar tubercle.

There is another specimen (No. 112) also from Monte Sacro, in the Mineralogical Gallery of the Museum, of the last successional premolar, left side, beautifully preserved (Pl. XXXII. fig. 5), and very little worn (like No. 111). It shows a double crochet plate projected in front and downwards, as in De Christol's drawing (fig. 25[1]), but is perfectly free from the combing plate of the outer ridge shown in that figure. It is very nearly in the same stage of wear, and has plenty of cement on the outer surface; the crown is high. There is a well-marked basal bourrelet on the inner side, proving it to be a premolar, and a layer of cement above the bourrelet. The second and lower crochet plate is much smaller than the upper; the two are very unequal, and it is also much less worn. There is very little obliquity in the disc of the posterior barrel, which is parallel to the front barrel; the posterior valley is very large. Ponzi's worn specimen is proved by this to be the third.

Dimensions.—Length of crown, outer side, 1·75 in. Length of crown, inner side, at base, 1·55 in. Length of ditto at middle, 1·55 in. Transverse diameter at base anteriorly, 2·2 in. Transverse ditto posteriorly, 2·15 in.

Lastly, No. 113, also from Monte Sacro, is a first true molar, upper jaw, left side. The crown is nearly in the same stage of wear as Ponzi's milk molar (Pl. XXXII. fig. 7), but is a good deal rolled. The posterior colline is broken off.

[1] Reproduced in Pl. xviii. fig. 1 of this work. See *antea*, p. 328, *note*.—[Ed.]

C. *In Signor Ceselli's Collections, from Torre di Quinto and Ponte Mammolo.*

In Signor Ceselli's collections from Torre di Quinto there is an antepenultimate true molar, right side, of Rhinoceros. It is in nearly the same stage of wear as the penultimate in the Sapienza Museum (p. 374), though of the opposite side, and is very much smaller in all the dimensions, but the height of the crown proves it not to be a milk molar. The crochet forms a very open angle, and a combing plate is emitted from the middle of the outer ridge converging a little towards the point of the crochet. There is also a short combing process emitted from the anterior colline overlapping the tip of the crochet, and a little above it. Further, deep down in the valley, are additional denticular complications, forming a ring or a loop, one leg joined to the outer ridge, one to the outer colline: very complex.

The disc of the posterior colline is directed backwards, with torsion of the apex. There is a small intercolumnar tubercle and a good deal of cement. In all the characters the tooth agrees with the Montpellier *R. megarhinus*, and in general plan it is very like the drawing of the milk molar.

Dimensions.—Extreme length of crown, outer side, 2·2 in. Extreme ditto, inner side, near base, 1·5 in. Transverse diameter in front near base, 2·1 in. Transverse ditto behind, at enamel edge below (very oblique), 2·1 in. Greatest height, outer surface, 2·1 in.

The specimen is encrusted below with volcanic gravel. It has no fangs, and is rolled below. There is some cement at the mouth of the transverse valley, and an abundant layer of it on the posterior valley lining the surface.

Signor Ceselli's collection (from Ponte Mammolo) also contains a very perfectly preserved second premolar, upper jaw, right side, of Rhinoceros, slightly worn (*i.e.* a little less than the milk molar of Ponzi, Pl. XXXII. fig. 7), and in the best state to show its characters. The summit of the crown shows distinctly three fossettes, *i.e.* one formed by the anterior transverse valley, one by the posterior valley, and the third an oval pit included between the termination of the crochet and the combing plate, emitted from the middle of the outer ridge nearly in front of the dorsal vertical ridge. The two are fused into a confluent wall, of which the combing plate is the thickest. The posterior valley has intruded into it, from the posterior outer vertical groove (which resembles in form that of a horse), a very thick blunt plate dividing the end of the valley into two branches. The termination of the anterior valley (exclusive of the third fossette) is somewhat reniform, concavely parallel to the posterior end, and free from any minor plates. The anterior disc forms a narrow strip, little worn; the posterior disc is nearly the same, and has not much obliquity. There is no torsion, no posterior colline at the apex, and no intercolumnar mammilla, but a well-marked basal bourrelet to the inner side. The outer surface resembles the molar of a horse.

Dimensions.—Length of crown, outside, 1·45 in. Length of ditto, inner side, at basal bourrelet, 1·1 in. Length of ditto, in middle, to ditto, 1·35 in. Transverse ditto, in front, base, 1·6 in. Transverse ditto, behind, 1·6 in. Height of crown, outside, 1·7 in.

The specimen has volcanic sand matrix, and is rolled below; the fangs are entirely gone. There is no cement remaining. The enamel is smooth. It is from Ponte Mammolo (Monte Sacro).

In the same collection from Torre di Quinto there is also a penultimate, or antepenultimate true molar upper jaw, left side, considerably more advanced in wear than the others, and differing in some degree from them in the general form of the crown (Pl. XXXII. fig. 8). It is more advanced in wear even than the detached *R. hemitœchus* tooth brought for comparison, and the worn summit is much flatter than any of the others, except Ceselli's very old compressed tooth. The general contour of the crown is more square, and with less inequality between the front and posterior diameters, approaching somewhat in this respect *R. hemitœchus*. There are two valleys, the posterior of which is triangular and ground low, and the inner slopes in a more shelving manner than in *R. hemitœchus*. The middle valley opens into a triangular fissure; it is then bent nearly at right angles, by the intrusion of the crochet, and terminates in a complex *cul de sac*, which is three-lobed, or trefoil-shaped. The termination of the middle valley is not unlike a more advanced degree of the large penultimate in Pl. XXXII. fig. 4. A thick short plate is projected backwards from the anterior colline overlapping the direction of the crochet, and pointing parallel to it from the opposite side; the ordinary combing plate from the outer ridge is projected inwards at right angles to the apex of the crochet, but more as a deep-seated denticle, the apex of which is still partly free. The crochet makes the third division. The crochet differs very much in direction from the other specimens. It is thrown forwards at a *right angle*, but with none of the boot-shaped thickening of *R. hemitœchus*. The length of its inner border is fully equal to the width of the posterior colline disc. There is a small intercolumnar tubercle at the mouth of the valley. The anterior colline presents a sausage-shaped broad disc; the posterior barrel has somewhat of a horse-shoe pattern (from the posterior valley), but the disc is very wide. The anterior outer vertical groove is wide and deep; but the outer edge of the crown is less angular in its outline than usual, the points having been probably abraded by rolling. The anterior overlapping sinus is much more pronounced than in *R. hemitœchus*.

The crown differs in its general pattern a good deal from the others. The crochet is at right angles, but it is not the crochet of *R. hemitœchus*. It certainly is not of *R. tichorhinus*. On the whole, I regard it as an unusual form of *R. megarhinus*. The greater width at the inner side and the abrasion of the outer edge give the peculiar appearance.

Dimensions.—Length of crown (antero-post.), outside, 2·25 in. Length of ditto in middle, 2·1 in. Length of ditto at inner side, about 1·95 in.

The fangs are wanting and replaced by volcanic sand matrix. The fangs had been rolled. The enamel is smooth and rather thin; the cement is entirely gone.

In the next place there is an antepenultimate (penult.?) true molar, upper jaw, right side, very far advanced in wear, of large proportional size, but very much compressed (Pl. XXXII. fig. 9). It retains the fangs, perfect to their points. An oblique fracture (at *a*) has damaged a small portion of the posterior barrel, and another recent (at *b*) has removed the anterior outer angle and the layer of enamel. The surface of the ivory here shows some very beautiful bluish black dendritic crystallization penetrating into the ivory. The crown is oblong across (the disproportional width to length being much more than is shown in the figure), and

is ground down very low. There are two fossettes; that of the posterior valley is a small round hole. The transverse valley is a very contracted fissure at the commencement, terminating in a 'duck's head' kind of *cul de sac*. The crochet is short and thick, and given off at a very open angle; at the ends and inner side of the tooth there is a very thick layer of cement. The crown in amount of wear and pattern (except in the direction of the combing plate) is not unlike the antepenultimate *R. hemitœchus* (m. 1), in Dinkel's drawing with the six molars. (See Plate XVI. fig. 1.)

Dimensions.—Greatest width of crown near ant. fract. at top, 2· in. Greatest ditto behind, at posterior barrel, 1·7 in. Greatest ditto of crown at base, front, 2·5 in. Greatest ditto behind, 2·5 in. Antero-posterior diameter of crown at top, outer, 1·8 in. Antero-posterior diameter of crown at top, inner, 1·6 in. Antero-posterior diameter of crown in middle, 1·7 in. Antero-posterior diameter of crown, greatest, 1·8 in.

The enamel is smooth, the cement is thick, and there is volcanic sand below.

Lastly, in Signor Ceselli's collection, from Torre di Quinto, there is a detached penultimate right molar, lower jaw, having a disc of pressure in front and behind. It agrees exactly in form with the penultimate described of Ponzi's jaw fragment (p. 374), but is a trifle larger. It is nearly in same stage of wear.

Dimensions.—Extreme length, 2·1 in. Width of front barrel, 1· in. Width of rear barrel, 1·2 in.

It has a very thick coat of cement between the barrels, which has been rubbed off elsewhere; this is as thick as in *R. hemitœchus*. The enamel is smooth, but rather thick. The fangs are present.

In Signor Ceselli's collection from Ponte Molle there is also a third premolar, lower jaw, right side, well worn.

Dimensions.—Length of crown, 1·4 in. Width in front, 0·9 in. Width behind, 1·1 in.

D. *In the Museum of the Jesuits' 'Collegio Romano.'*

Examined a very remarkable fragment of the transverse half posterior portion of a last true molar, upper jaw, left side, of a Rhinoceros, in different mineral condition from all the other Roman specimens. It shows a tubercle with four crenatures, attached to the base as in the Montpellier specimen, and the addition to the valley of a combing plate, thick, and pointing at right angles to the crochet; there is also a very distinct intercolumnar tubercle. The disc of the compressed posterior barrel is very well preserved. The enamel is of a bluish grey or lead colour, thin and smooth; there is some cement outside. The ivory is chestnut-coloured, like the Pignano Elephant ivory;[1] the matrix is seen to be a blue clay. The specimen is certainly not from the quaternary volcanic sands of Rome; its origin is not known.

The tooth is very much smaller than Ponzi's last molars.

Dimensions.	Inches	In Ponzi's A. (p. 372) Inches
Transverse diameter near base	2·2	2·6

But for the small size, I would have referred this specimen to *R. megarhinus*, notwithstanding the combing plate, in consequence of resemblance of general form, the exact resemblance of the adpressed basal

[1] See *antea*, p. 187.—[Ed.]

DESCRIPTION OF PLATE XXXII.

RHINOCEROS LEPTORHINUS (R. MEGARHINUS).

Figs. 1 and 2. Represent the penultimate and last upper molars of *R. leptorhinus*, about three-fourths of the natural size, and are taken from two of the casts mentioned at page 398, as having been obtained by Dr. Falconer at Stuttgart. The original teeth are those upon which Jäger founded his *Rhinoceros Merckii*. The casts are now in the British Museum.

Fig. 3. Represents a sixth or penultimate upper molar, left side, in the Nice Museum, about three-fourths of the natural size. The drawing is copied from one brought by Dr. Falconer from Nice. (See page 370.)

Figs. 4 to 9. Represent six molars in the collections at Rome. The figures have been copied by Mr. Dinkel from drawings brought by Dr. Falconer from Rome.

Fig. 4. Is a penultimate upper molar (t. m. 2), left side, from Monte Sacro, in the Sapienza Museum, three-fourths of the natural size. (See page 374.)

Fig. 5. Represents the last upper premolar (p. m. 4), left side, three-fourths of the natural size, also from Monte Sacro in the Sapienza Museum. (See page 375.)

Fig. 6. Is a last true molar, upper jaw, left side, three-fourths of the natural size. The specimen is in Professor Ponzi's collection, and is from the Gravel-beds of Ponte Molle. (See page 372.)

Fig. 7. Is an upper milk molar, left side, three-fourths of the natural size, also in Professor Ponzi's collection, from the Gravel-beds of Ponte Molle. (See page 373.)

Fig. 8. Is a penultimate or antepenultimate true molar, upper jaw, left side, three-fourths of the natural size, in Signor Ceselli's collection, from Torre di Quinto. (See page 377.)

Fig. 9. Is an antepenultimate true molar, upper jaw, right side, very far advanced in wear, about three-fourths of the natural size, also in Signor Ceselli's collection. (See page 377.)

Fig. 1.

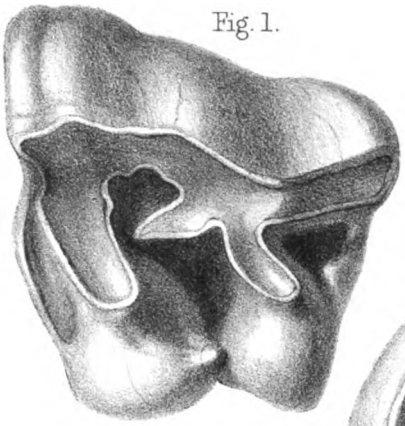


Fig. 3.

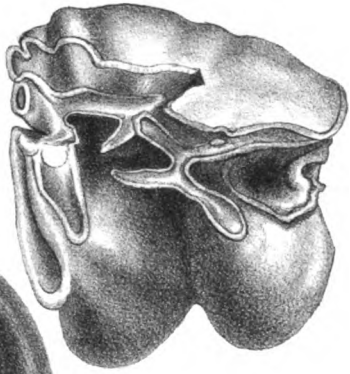


Fig. 2.

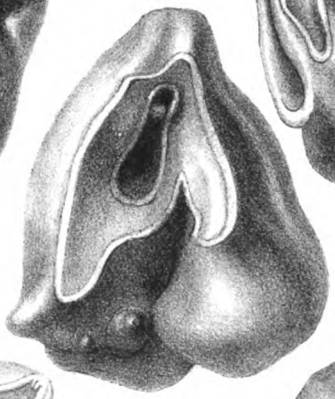


Fig. 4.

Fig. 5.

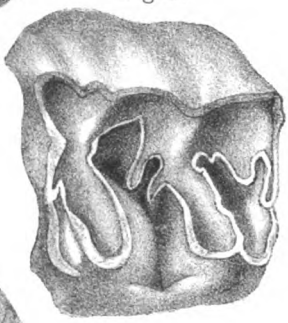


Fig. 6.

Fig. 9.

Fig. 8.

Fig. 7.

J.Dinkel lith.

W.West. imp.

Rhinoceros leptorhinus (R. megarhinus)

tubercle behind, and the form of the crochet (open angle), together with that of the disc of the posterior barrel and the width and broad deep furrow of the outer angle.

The upper molars of *R. leptorhinus*, which I have examined at Rome, are: 3 of t.m. 3; 1 of t.m. 2; 4 of t.m. 1; 1 of p.m. 4; 1 of p.m. 3; 1 of p.m. 2; and 1 of m.m.

I have not seen a trace of an indigenous tooth of *R. tichorhinus* in any of the Roman collections. The teeth in the Kircher Museum are evidently of foreign origin. They consist of one upper molar and of two lower molars, all detached and worn, with the yellow ochre matrix of the Devon and Somerset caves.

VI.—Note on R. Leptorhinus from Montignoso, near Leghorn.

Florence, May 20, 1859.

No. 1.—Is a fragment of the anterior part of the right maxillary, showing the antepenultimate and penultimate premolars much worn. Compared them with Jourdan's casts and drawings from Montpellier (p. 369), and found them to agree exactly.

No. 2.—Is a penultimate or antepenultimate true molar, upper jaw, left side, exactly like the Montpellier specimens.

No. 3.—Consists of a penultimate and antepenultimate of upper jaw, right side, detached and well worn, agreeing closely in form with the Montpellier specimens. In the penultimate, a very thick layer of cement lines the posterior valley and both the outer anterior angles; the groove is broad and deep.

No. 4.—Is a specimen of the last premolar, upper jaw, right side, in beautiful preservation and showing the characters very perfectly. The posterior barrel throws forward two crochet processes nearly of the same size, of considerable thickness, and well separated; the outer ridge throws off converging 'combing plates,' nearly of the same size, so that the sinuosities of the transverse valley are very complicated.

No. 5.—Is a fragment of the lower jaw, left side, containing the penultimate true molar, partly worn, but having the crescents still separated.

These specimens are of great interest in proving the extension of the *Rhinoceros megarhinus* into the '*Val d'Arno inferiore*.' They were found along with remains of *Elephas antiquus*.

VII.—Note on Rhinoceros from Val di Chiana.

Arezzo, May, 1859.

Examined a lower jaw, right side, of Rhinoceros in the same mineral condition (*i.e.* white and adhering to the tongue), as the large Elephant femur and bovine heads from the Val di Chiana in the Florence Museum. Only part of the symphysis is present. The anterior margin of the right ascending ramus is present, but the posterior angle is wanting. The jaw contains the five last molars *in situ*. The antepenultimate premolar has dropped out, but its two fangs are seen. The molars are well worn; the crown of the first true molar is worn out; and in the last the discs of the crescents are united. The teeth show marks of a thick layer of cement dislaminated; there is an oblique bourrelet on the outside of the barrels as in *R. megarhinus*. The enamel is thickish and

smooth. It certainly does not belong to *R. tichorhinus*, and the teeth are too large and too broad for the Rhinoceros of the Val d'Arno. It is probably, *R. megarhinus*, and is an important specimen. The lower jaw is very low for the thickness and size of the teeth.

Dimensions.—Length of line of six molars, 9·5 in. Length of crowns of the five, 8·1 in. Length of three last molars, 5·6 in. Approximate length of three premolars, 4· in. Length of two last premolars, 2·5 in. Length of crown of penultimate true molar, 1·85 in. Greatest width of ditto, 1·2 in. Length of last molar, 2·1 in. Total length of fragment, 14·5 in. Height of jaw inside at penultimate premolar, 2·5 in. Height of ditto at last molar, 3·8 in. Greatest thickness of jaw below, 2·1 in.

Another specimen of left side of lower jaw is very like the above, but all the teeth are wanting.

VIII.—Description of Remains of R. Leptorhinus in Museum of Nat. History at Turin.

April, 1861.

A very beautiful specimen of a right ramus of the lower jaw of a fossil Rhinoceros, marked 'Foss. nei sedimenti fluvio-lacustri pliocenici tra Dusino e S. Paolo (dono dell' Ingegnere Commend. Barbavara),' in a hard mineral condition, weathered grey, containing the whole of the molar series *en suite*, and part of the symphysis, but the diastemal edge entirely gone; the horizontal ramus quite entire from the first premolar backwards, but the angle broken off; part of the anterior and basal portion of the ascending ramus present, but the fracture rounded by abrasion.

The teeth in form, and amount of wear relatively, is nearly a perfect reproduction of Gervais' Montpellier lower jaw (Pl. II. fig. 8 of 'Zoolog. Française'), from the first to the last, so much so that the one might be taken for the other. But unfortunately, the Turin specimen wants all the incisive and diastemal portion. The horizontal ramus is very low, as compared with the double lower jaw got in the Mastodon deposit. The posterior boundary of the symphysis is in a line with the posterior third of the penultimate premolar. The lower edge of the ramus is very horizontal from behind on to the premolars.

The characters of the molars in this specimen are a good deal as in Mr. Gunn's lower jaw. One character of great importance is to be noticed, that on the outside of the penultimate molar, in the furrow between the crescents, there is a very thick layer of cement; it is only partially present, and probably is dislaminated elsewhere.

Dimensions.—Length of six molars, 9·5 in. Length of three true molars, 5·4 in. Length of three premolars, 4·1 in. Length of first premolar, 1·2 in. Length of second ditto, 1·3 in. Length of last ditto, 1·5 in. Length of antepenultimate true molar (middle of crown), 1·6 in. Length of penultimate ditto, 1·7 in. Length of last ditto, 1·95 in. Greatest height of jaw to alveolar edge of last molar, inner side, 3·3 in. Height of ditto at first true molar, 2·75 in. Greatest height at antepenultimate premolar, 2·4 in. Greatest thickness of jaw, 1·85 in. Height behind last molar, inner side, 3·4 in.

In the same Museum there is also a penultimate or antepenultimate true molar, upper jaw, left side, of *Rhinoceros leptorhinus* (*megarhinus*). The anterior outer angle is a little broken, but the crochet has the same character as in the Grays Thurrock variety. It is certainly not *R.*

Etruscus. But the matrix is exactly like the Sansino of the Val d'Arno. It is from the railway cutting near Dusino.

There are also two upper premolars showing the bourrelet very strong, but the crown still covered with matrix, of the same species and from the same locality, with a yellowish ferruginous matrix.

IX.—Description of the Cortesi Rhinoceros Cranium.[1]

Natural History Museum, Milan, April 24, 1861.

The cranium, upon the whole, is in a very remarkable state of preservation, and is now very much in the condition as described by Cortesi in the 'Saggi Geologici.' It is entire, from the tips of the nasal bones to the occiput; the left side of the occipital crest being the part chiefly damaged. The skull, like Jourdan's Lyons Museum Cranium (Pl. XXXI. fig. 3), had undergone lateral pressure, so as to have been slightly crushed. This is well shown on the basal aspect; when an axial line is drawn along the base of the sphenoid through the palate, the palatal portion is seen to be deflected towards the right side; and the spheno-palatine bones are crushed. The whole of the right zygomatic arch is present, but partly crushed in upon the zygomatic fossa. The crush has acted upon the palate, so as to elevate considerably the series of molars upon the left side, above the plane of those of the right; the former being pressed a little outwards, the latter inwards, upon the plane of the palate. The left zygomatic arch is partly wanting, but the basal portions at either end are present, and the posterior stump shows that a portion at least has been lost by a comparatively recent fracture (since found). The mastoid process on the left side is broken off, while the greater portion of the styliform process behind it is present; *vice versâ*, on the right side the greater portion of the mastoid process is present, while the styliform is broken off. The two (occipital) condyles are present, and nearly undisturbed, although somewhat damaged; the occipital part of the cranium has fortunately escaped pressure; the lateral margins and crest on the left side are nearly entire; the upper third of the right side is broken off. The right occipital condyle is traversed by two fissures; the left has lost a portion towards the occipital plane. On making a further search among the fragments in the case, I found the missing portion of the left mastoid, which is now seen perfectly entire, and probably a further search would lead to the discovery of some portion of the missing part of the left zygomatic arch. I found the specimen taken off its stand, and laid upon a pad of straw with the palatine surface uppermost, preparatory to being drawn. Seen in this aspect, it bears a very close and remarkable general resemblance to Jourdan's Lyons skull (Pl. XXXI. fig. 3, p. 369), which is also somewhat crushed, but in the reverse direction (*i.e.* according to the lithograph), viz. from right to left (Cortesi's skull being from left to right). The occipital condyles in the Lyons cranium are obliquely displaced, while in Cortesi's skull they are in their natural position. The bony part of the cranium is a good deal cracked and shivered, so as to break off into minute pieces when the matrix is detached; but it is highly injected with ferruginous infiltration, and completely mineralized. The matrix consists of a greyish yellow compact clay (marna azzurra), which is hard and mottled with ferruginous

[1] Dr. Falconer was unfortunately not permitted to take any drawings or casts of this cranium.—[Ed.]

blotches. A portion of the diastemal and incisive prolongation, which is wanting in the Lyons skull, is fortunately present in the Milan specimen. The series of molars is present on both sides, but the summits of most of the crowns are more or less involved or concealed by matrix, which has been left very nearly as when found by Cortesi. The following teeth are present or indicated:—

A. *Right Side.*—1. Immediately behind the commencement of the diasteme, on the right side, the empty socket is distinctly marked of a single-fanged premolar, being the normal pre-antepenultimate (p.m. 1). The alveolus is oval in the transverse direction, and about eight lines in diameter. I have picked some of the matrix out of it, so as clearly to define the pit, and am quite certain of the accuracy of the observation. The corresponding socket of the same tooth is present on the left side, but has not been picked out to the same extent.

2. *The antepenultimate premolar or* (*p.m.* 2).—The shell of the crown of this tooth has been broken off, but it is fortunately preserved on the left side, and will be noticed in the sequel.

3. *The penultimate premolar or* (*p.m.* 3).—The shell of enamel nearly all round the circumference of this tooth is preserved, but the central convolutions and the anterior inner barrel have been ground down and destroyed by a recent crush. The salient point of the outer shell of enamel is very high, and it almost looks at the posterior point as if it had not been subjected to wear; but this is very doubtful, there being no ivory attached to determine the point. The corresponding tooth of the opposite side is present nearly entire; but the outer half of the crown is covered by matrix which conceals the convolutions.

4. *The last premolar* (*p.m.* 4) is present, and beautifully perfect. It had evidently come but very lately into place, as the edges only of the anterior and posterior barrels are slightly worn into narrow crescentic discs, and the outer edge is also but slightly affected by wear. The level of the crown is depressed below the level of both the tooth which precedes it, and of that which is behind it; it is in a considerably less advanced state of wear than the next succeeding teeth (*i.e.* t.m. 1 and t.m. 2), and therefore had come into place more recently than either of them. The basal bourrelet is distinctly marked at the anterior and posterior ends, but only very obscurely around the base of the inner side, as a slightly crenulated inequality. The anterior and posterior barrel ridges are nearly transverse and parallel, the posterior fossette is very large and intact behind. The crochet plates are very complex, forming four pectinate laminæ, which are directed forwards so as to meet an accessory plate thrown off inwards from the outer ridge, which divides the central termination of the middle valley into two nearly equal divisions. In this respect, the tooth resembles very closely fig. 25 of De Christol's plate (see Pl. XVIII. fig. 1), but with this difference, that the crochet plates in the latter are only two, while in the Milan tooth they are closely approximated and are four in number. But De Christol's tooth is more advanced in wear, and the crochet plates would be reduced in number in the Milan tooth by further abrasion. One of these plates advances so as nearly to meet the accessory outer combing plate, and thus isolate a distinct fossette. There is a contortion of the apex of the posterior barrel (as in Pl. XVIII. fig. 1).

On the opposite side the corresponding tooth is apparently wanting, its place being occupied by matrix. This would indicate either that

the last premolar, left side, had never emerged, or that it had dropped out after emergence. (On subsequently removing the outer alveolar wall it was visible.)

The basal bourrelet, as a general rule, is but indistinctly exhibited in all the premolar teeth of this specimen.

5. *The antepenultimate true molar* (*or t.m.* 1).—This tooth is present in a more advanced state of wear than either p.m. 2, 3, or 4, the stage of detrition being about the same as in De Christol's fig. 18 (copied in Pl. XVIII. fig. 3), but even a little more advanced. The crown of the tooth had originally been quite entire in this specimen, but it had got crushed and shivered; the pieces have been replaced in position with glue. The posterior fossette and the whole of the middle valley are enveloped by matrix, so that the offset of the crochet is entirely concealed, as is the greater portion of the inner side of the two barrels. The anterior basal talon bourrelet is very pronounced, with a crenated margin. The corresponding tooth of the opposite side (left) is also present, and still more perfectly conserved; but the crown is nearly entirely enveloped by matrix, so that the characters yielded by the crochet are not visible.

6. *The penultimate* (*or t.m.* 2), *right side*.—This tooth is present and quite perfect, but is pressed slightly inwards upon the palate. The outer shell of enamel is seen to be quite perfect, and the outer ridge but very slightly abraded, the boundary of the posterior fossette being quite entire. The anterior barrel has its edge but slightly abraded, a little more in degree than p.m. 4; the whole of the central valley and of the inner sides of the barrels are enveloped by matrix, so that the form and offset of the crochet and the anterior basal talon are completely concealed. This concealment of the most characteristic part of the crown is much to be regretted for my present purpose. The corresponding tooth of the opposite side is also present, but fractured and repaired; it is slightly dislocated outwards (like the whole of the series of the left side), exposing completely the inner side of both barrels down to their base. There is not the slightest trace of an internal basal bourrelet, and the summits of the barrels, more especially the hind one, show very markedly the peculiar twist seen in fig. 18 of De Christol's plate (as copied in Pl. XVIII. fig. 3). This character is equally seen on the corresponding parts of p.m. 1, left side.

7. *The last true molar* (*t.m.* 3) of the right side had not emerged, and there is not a trace even of its presence, the corresponding alveolar part of the maxillary bone being crushed in and covered by matrix; but, as will be seen in the sequel, the germ of this tooth is distinctly present on the left side.

B. *Left Side*.—1. *The pre-antepenultimate, or* (*p.m.* 1).—The single-fanged alveolus of the first premolar is present, as in the opposite side, distinctly defined, and partly occupied by matrix.

2. *The antepenultimate, or* (*p.m.* 2).—The crown of this tooth is present, quite perfect, and but very slightly affected by wear. In a general way it resembles very closely fig. 1 of Gervais' Pl. II. ('Paléontologie Française'), with the exception that the basal bourrelet, which is distinctly present upon the anterior barrel, is less pronounced on the posterior barrel than seen in that figure. The crown has a similar sub-triangular form, *i.e.* broad externally, and contracting inwards. The apex of the anterior barrel, which is all but intact, forms an

isolated flattened conical cusp, as in Gervais' fig. 3. Pl. II. of tom. ii. of the 'Memoirs of the Montpellier Academy of Sciences,' but of a larger size than in that figure. The posterior colline is seen to be but slightly abraded by wear; the whole of the posterior fossette and the central crochet convolutions are entirely concealed by matrix. This tooth appears to be nearly in the same stage of abrasion as p.m. 4 of the opposite side.

3. *The penultimate premolar* (*p.m.* 3).—The whole of the shell of this tooth is present, but the outer half of the crown is completely enveloped by matrix. The anterior and posterior barrels are seen to be but slightly abraded, *i.e.* to about the same extent as t.m. 2; the breadth of the tooth across the anterior division is much greater than the length. There is a crenulated anterior talon, but only a very obscure appearance of bourrelet at the base of the anterior barrel; none is visible behind, but this part of the tooth is enveloped by matrix. The vertical furrows upon the outer surface of the enamel of this and the preceding tooth are but very indistinctly marked. The same observation applies to p.m. 4, of the opposite side, in which the anterior vertical furrow is also indistinctly marked.

4. *The last premolar* (*p.m.* 4) on this side, as already remarked, appears entirely wanting, and its position is occupied by a block of matrix; but on reversing the cranium, it is distinctly seen enclosed in its alveolus, below the mass of matrix.

5. *The antepenultimate true molar* (*t.m.* 1).—The crown of this tooth is nearly perfect, although somewhat shivered. The summit is almost entirely enveloped by matrix concealing the crochet and other convolutions. The vertical furrow of the anterior outer angle is broad and shallow, but well pronounced—broader than in De Christol's fig. 18 (see Pl. XVIII. fig. 3). The summits of the barrels are in the same stage of wear as described of the tooth of the opposite side. The outer surface of the posterior division is slightly concave and flattish.

6. *The penultimate true molar* (*t.m.* 2).—This has its crown more exposed than on the opposite side, but it has been fractured, and the pieces have been imperfectly replaced. The peculiar twist of the apices of the barrels has been already noticed. The anterior vertical furrow seen at the outer angle of the tooth of the opposite side is also here well marked.

7. *The last true molar* (*t.m.* 3), on the left side, is distinctly seen in the state of germ, hardly emerged above the alveolar level, and embedded in the jaw. About an inch in height of the posterior ridge is exposed by the removal of the alveolar wall. The edges are quite intact, and about an inch and a half below the level of the next preceding tooth. The principal valley is completely filled up by matrix, but it is visible that the crown had the sub-triangular form, which is characteristic of the same tooth in the existing bi-corned African Rhinoceros.

Obs. 1.—The enamel surface in all these teeth is tinged of a bluish grey, which Cortesi compares to an incipient tint of turquoise. The enamel is perfectly smooth, *i.e.* entirely free from any superficial rugosity, as in the *tichorhine* Rhinoceros, and I could detect upon none of the teeth any indications of a coat of cement. There is certainly nothing approaching the enormous coat of cement seen on the teeth of *Rhinoceros hemitœchus*; the enamel is not so thick as in that species, nor so rugous on the surface. The ivory-core of all the teeth is highly infiltrated with iron, showing a dark amber colour; the general colour of

the teeth resembles in its pearly aspect that of the molars of *Rhinoceros Etruscus*, in the Museum at Florence. It is important to remark in reference to the measurements, that on the right side the penultimate does not overlap the first true molar, there being three-tenths of an inch interval between. There is nearly the same interval between the antepenultimate true molar and the last premolar, and also between the third and fourth premolar, showing that these molars have been displaced, and giving undue length to the measurement of the entire series on the right side. They are in their natural state of apposition on the left side. The length of the series, from the anterior end of the second premolar to the posterior margin of the second true molar, which includes five teeth, amounts exactly to 10·2 inches, and from the anterior border of the first premolar to the same point behind, to 10·9 inches (or nearly 11 inches).

Obs. 2.—Cortesi's figure in the 'Saggi Geologici' (Pl. VII.) is apparently of the left side (the nasals and symphysis pointing to the left, the occiput to the right); but the figure is exhibited reversed, and in reality it represents the right side. The same remark applies to fig. 7, Pl. IX. *Rhin.* of the 'Ossemens Fossiles,' professing to be on the scale of one-sixth of the natural size. The lower jaw, which is placed in relative position below the cranium in both these cited figures, is also figured reversed. Cuvier asserts that his engraving was made after drawings sent by Adolphe Brongniart, and these have hitherto been assumed to have been originals; but it is clearly manifest that Brongniart's is merely a copy of Cortesi's figure. The uncouth lower jaw is foreshortened precisely alike in both, so as to show the line of molars on both sides, both coronoid processes, both sigmoid notches, and both condyles. In fact the figures are so much alike that it is impossible to doubt that the one was copied from the other. There is the same nick to the broken edge of the left coronoid process, and to the broken end of the incisive bone. The principal differences are, that the mastoid shown in Cortesi's figure is omitted by Brongniart; that the rim of the orbit and the outline of the zygomatic arch, together with the shading of the orbital cavity and zygomatic fossa, are better defined by Brongniart than in Cortesi's figure. The uncouth occipital pyramid rising into a conical peak, and evidently exaggerated in Cortesi's figure, is less salient and more naturally represented by Brongniart. As regards the lower jaw, Cortesi's figure represents a salient mass of matrix on the lower margin of the jaw, below the penultimate figured tooth (*i.e.* t.m. 1), all of which is omitted by Brongniart, who gives a clear outline to the lower margin. But this mass is still undisturbed with the rest of the matrix, as when left by Cortesi.

Obs. 3.—De Christol, in his remarks upon Brongniart's figure of the lower jaw, passes some severe strictures upon the low height and little projection of the coronoid process above the alveolar margin, &c. But these are all explained away by the fact that a great deal of matrix is still left enveloping the jaw, and that a part only of the crowns of the two last molars that are *in situ* emerge above the cake of matrix. When the natural object is compared with fig. 5 of De Christol's drawing (profile) it is manifest that there is a great general agreement of form between the Montpellier and Milan specimens, and even an inexperienced observer would at once remark the similarity of the symphysial expansion in both.

Obs. 4.—The antepenultimate premolar (p.m. 2) of the left side in the Cortesi specimen resembles in the closest manner the corresponding tooth represented by De Christol in fig. 27 of his memoir.[1] The anterior cusp forms in both an isolated compressed cone, the apex of which is just beginning to be abraded, and the posterior barrel has its edge ground down into a narrow crescentic band, which is alike in both. The principal difference observed is, that the basal bourrelet is more strongly represented in De Christol's figure than it is seen in Cortesi's.

Obs. 5.—The lower jaw of Cortesi's specimen is seen to be in the most fragile state of disintegration. On detaching a slab of the matrix, measuring 3½ inches by 3 beneath the second and third premolars (p.m. 2 and 3) on the left side, it was seen that the fibrous roots of herbaceous plants had insinuated themselves between the matrix and the surface of the jaw, forming a web, and that the bony mass of the latter was cracked and fissured in every direction, penetrated by roots, and in a state of the most rotten decay. The lower jaw was evidently discovered uncrushed. A great mass of matrix is interposed between the rami from the symphysis on to behind the last molar, yielding the dimensions given in the table (viz. Nos. 17 to 21). The details of the teeth in the lower jaw are as follows:—There is not a trace of incisives, the beak being partly damaged at its edge, where they might be looked for, and the diastemal ridges being also abraded. The lower contour of the beak expansion is disguised by a cake of matrix, which has vitiated both Cortesi's and Brongniart's drawings; otherwise it would be like Christol's fig. 6. There is no trace on either side of an alveolus for the pre-antepenultimate, but it is by no means certain that it may not have been there to correspond with the tooth in the upper jaw. The antepenultimate premolar present upon the left side consists of two crescents, both of which are only in the slightest degree affected by wear. The lower half of the anterior end bears a smooth surface, which appears to be the disc of pressure against a pre-antepenultimate, which had dropped out. This disc of pressure for the pre-antepenultimate of lower jaw, left, occupies nearly half the height of the crown and is sagittate in form, like a Celtic arrowhead of flint. From the broad surface of the anterior end of the antepenultimate, and the appearance of a disc of pressure at its base, I am convinced that there must have been a pre-antepenultimate, corresponding with the upper one. The third premolar is present upon both sides, and both the crescents are slightly affected by wear, showing a narrow band of enamel all round. The anterior crescent in each is elevated about half an inch above the plane of the posterior crescent. The last premolar is wanting on either side, its site being occupied by a mass of matrix; the last milk molars had probably just fallen out, and their successors may be embedded in the jaw as germs. The two stumps of the fangs of the antepenultimate premolar are seen on the right side, the crown being broken off.

The first and second true molars are present on either side, both of them being but slightly affected by wear. The anterior division of each yields a horse-shoe pattern, of which the front limb is much shorter than the hind one. The posterior division yields a crescent with but a very slight curve. The last true molar on either side is wanting.

The condition of the dentition in both the jaw and cranium shows that they must have belonged to the same individual.

[1] Ann. des Sc. Nat. 2me Sér. tom. iv. 1835. Pl. iii. fig. 12. See *antea*, p. 328, *note*.—[Ed.]

Obs. 6.—De Christol's drawing, fig. 11, although stated by him to represent the left side, is in reality of the right. The ragged black shaded wall A of his figure represents pretty fairly the existing condition of the left wall of the nasal cavity, inner side; and although mistaken by him for a nasal septum, is exactly what Cornalia states it to be in his note to Duvernoy.[1] The light shaded portion included within dotted lines is not, as De Christol supposed, a fracture where a large piece was wanting, but in reality it represents a layer of argillaceous cement, which has been spread over the fossil from the orbit to the incisive termination, either to strengthen the specimen or to disguise fractures. A depression is left in the cement, indicating the position of the suborbitary foramen. It is exactly situated as in Cortesi's drawing, but the clay envelope deprives me of the means of deciding whether it really is the suborbitary hole or not. The fractured slab of the frontal between the orbits, indicated in Christol's drawing by the letter C is a mistake; the whole plateau of the frontal at this point, although cracked and broken into minute pieces, is entirely present. The angles of the lozenge on either side are broken over the orbits, and the drawing of the fracture on the right side has misled De Christol. On removing the cement, I find that the suborbitary foramen is present on the right side, and situated exactly over the line of junction between the third and fourth premolars; its posterior rim being in a line with the anterior third of the last premolar, and yielding the following dimensions:—From anterior rim of orbit to posterior margin of suborbitary foramen, 4·2 inches; from the same point, *i.e.* rim of orbit to bottom of nasal echancrure, 4·8 inches; from bottom of nasal echancrure to tips of the nasals, 8·4 inches; apparent entire length of nasal bones, measured along curve, from the naso-frontal suture to tips in the middle, 12· inches.

The uncouth representation in profile of the molar teeth in Cortesi's, Cuvier's, and De Christol's figures is owing to the fact already stated, that they are pressed inwards upon the palate, more especially the two last, and their most salient points therefore appear fore-shortened; the representation of the opposite side would be much more natural. The orbit is immediately over the penultimate and last molars, its anterior margin on both sides falling in the line between the antepenultimate and penultimate true molars. The outline of the naso-maxillary sinus is well pronounced, as in Cuvier's figure, and the present height, which is partly concealed, is approximately 4·2 inches, taken about the middle. Strictly speaking, the orbit is situated immediately over the penultimate true molar.

Continuation of Description of the Cranium.

Most of the details in the anterior part of these remarks were taken when the Cortesi cranium was lying with the palate upwards; it has since been turned and mounted on a tripod stand, admitting the profile and upper surface to be compared.

Profile.—This bears, as stated by previous describers, a close general resemblance to that of the Sumatra bicorned Rhinoceros. The skull has been exposed to lateral pressure, which has crushed in the right zygomatic arch and the maxillary wall of the face, in front of the right

[1] See *antea*, p. 314.—[Ed.]

orbit, under the chaffron. The occipital part is not nearly so perfect now as in Cortesi's time, the left side of the occipital crest being broken off, together with the posterior and upper part of the parietals, to an extent of five inches in length by four in width. In consequence, the posterior termination of the sincipital echancrure and the posterior extension of the occipital crest behind the occipital plane are no longer seen. The diploe cells are exposed where the upper plate of the parietal has been removed, giving rise to the tessellated ragged lines of De Christol's figure, but less marked, and not extending so far forward as he shows. The right zygomatic fossa is covered over by a cake of matrix, about a quarter of an inch thick, as high as the fracture of the parietals; the left zygomatic fossa is covered by a thinner cake of the same. The lower three-fourths of the occipital are entire, more especially on the left side, and the lower half on either side, downwards towards the styloid process, is covered by a thick mass of matrix, all the central portion being bare. A great amount of hard matrix covers the whole of the facial portion from the orbit forwards, as far as the anterior third of the nasal arch, concealing entirely and blocking up the left side of the nasal fossa. This is the mass represented by the dark shade (A) in De Christol's figure.

The cranium, as a general character, looks more elongated, more slender, and much less massive than in the *Rhinoceros tichorhinus*; the cerebral portion is less elongated than in the latter, and the lateral edges of the occiput less projected backwards. The anterior slope of the cerebral pyramid makes a very considerable angle with the plane of the frontal, more perhaps than is seen in Cuvier's figure, but considerably less than is shown by Cortesi's, where the pyramid is exaggerated. The posterior face of the occiput inclines a little forwards as it ascends from the occiput upwards, more so even than represented by Cuvier's figure, and is then over-arched by the projecting sides of the occipital crest, which are produced backwards. It differs entirely from the reclined occipital plane seen in *R. tichorhinus*. The bones of the nose are elongated and slender in thickness, rather wide, and not much arched above; they are nearly of uniform width, thinning as they advance forwards. The nasal suture between them is distinctly marked and open; *there is not the slightest indication of a dividing nasal septum*; and I confirm entirely Cornalia's remarks upon this point. They are not so much arched as represented in Cuvier's figure, resembling more the outline given by De Christol. There is a slight central boss along the axis near the tip of the nasals, but I can detect nothing like an indication either upon the nasal or upon the frontals of the granular rugous inequalities which indicate the base of horns; the frontal, it is true, is cracked and fissured, but the nasal surface is entire and smooth. A strip of about an inch wide of matrix has been left near the tip and side of the right nasal bone. The absence of horned rugosities may be owing to the immature age of the animal, which is shown by the teeth and open sutures to have been not quite adult. De Christol describes the vault of the nasal bones below to be excavated in a boat-shaped fashion; nothing of this kind is seen in Cortesi's fossil, but their lower surface is still concealed by matrix. The character of the nasal bones entirely warrants the designation of *leptorhinus*, or thin nasal-boned *Rhinoceros*, given to this species by Cuvier; these bones are infinitely less massive than in the African Rhinoceros or the Indian species.

The zygomatic arches are crushed in on the right side and wanting on the left; the extreme height of the arch behind on the right side is about 2· inches. The characters of the temporal fossæ are not shown, in consequence of the state of the zygomatic arches. The form of the articular or glenoid surface for the lower jaw is also concealed by matrix. The intermaxillary portion does not appear to have been complete even in Cortesi's time; it has now been considerably further damaged by a fracture, and the missing piece has not been found. The diastemal edges, as already described, are prominent and well marked, bounding a gutter which contracts forwards; they are now very much in the state represented by De Christol's fig. 12 of the Montpellier form. The orbits are placed immediately over the sixth tooth or penultimate true molar. The position of the suborbitary foramen has already been described. The auditory foramen is well seen on the left side, but filled up with matrix; it resembles very closely that seen in fig. 12 of De Christol, running upwards in a gutter on the side of the occipital crest. In fact, the lateral and posterior part of the parietals and the lateral outline of the occipital crest towards the base on the left side very closely resemble the same parts in De Christol's figure, with this allowance, that in the latter the occipital condyles are wanting, while in Cortesi's they project boldly backwards. The terminal outline of the molar teeth of the left side resembles very closely, in a general way, that of Gervais' fig. 1 of Pl. II. tom. ii. of the 'Montpellier Transactions.' The height from the edge of the penultimate molar, left side, to the frontal plateau, which is crushed, amounts to about 11½ inches. On the right side the same measurement gives 9·7 inches. Unfortunately the orbital rim is not perfect on either side; it is best seen on the right, but the suborbital tuberosity is wanting.

Upper View.—When the skull is seen from above it presents the same elongated slender character as when seen in profile. This is somewhat exaggerated by the skull having been crushed laterally, and by the intrusion of the right zygomatic. In consequence of the immature age of the animal, there is no indication of the sincipital lateral ridges which define the temporal fossæ, so strongly seen in Gervais' fig. 2 of the Plate above referred to, and also in De Christol's fig. 13. Gervais' figure looks much wider in consequence of the presence of the zygomatic arches. De Christol's fig. 13 shows the nasals more massive proportionally than in Cortesi's fossil. In both of these the frontal plane is elevated between the orbits to sustain the second horn. This part of the skull is cracked, fissured, and depressed in Cortesi's fossil, and the angles of the trapezium over the orbits are broken on both sides. Making allowance for this depression, the profile outline of the Cortesi skull resembles more Gervais' figure than De Christol's, as regards the line of contour of the nasals and frontals. The crush is so considerable that on the right side the height from the upper rim of the orbit to the frontal plateau is only 2·4 inches. The sincipital contraction of the cerebral portion between the temporal fossæ is very much as in De Christol's figure; but the absence of bounding ridges on either side leaves no indication of a defined tablette.

Since the preceding remarks were written, I have been further able to restore the posterior missing portion of the left zygomatic arch and the greater part of the left articular condyle of the lower jaw.

On the whole, the Cortesi cranium is in a wonderful state of preser-

vation, considering the numerous removals which it has undergone. It was first deposited at Piacenza in Cortesi's time, then removed to the Museum of Mines in the Stradone di Santa Teresa. After remaining there many years, it was removed with the other Natural History collections in 1848 to the Palazzo Dugnani, and finally (1849) transferred to its present locale in the Museo Civico, Contrada della Maddalena al Cerchio, near the Piazza Santa Marta, along with the rest of Cortesi's fossil collections, which include the Whale skeletons and the palate (and other bones) of the *Elephas meridionalis* figured in the 'Saggi Geologici.' The skull, when De Christol's figure of it was made by Gené, appears to have been nearly in the same state as it is now.

Cortesi mentions, that along with the skull he found 10 vertebræ, 14 ribs, 2 scapulæ, and the 2 fore legs. On looking over the fragments in the case, parts of most of these remains are to be seen. Of the vertebræ there is an axis, which is entire, with the exception of the spinal portion of the neural arch. There are also 8 other vertebræ; the bones of the fore-legs and the scapulæ are unfortunately very much broken. There are 2 humeri, one of which is in three pieces, that do not admit of being joined. The head of another humerus of very large size is in the same mineral condition as the other. It belongs to the opposite side from that in Cuvier's fig. 9 of Pl. XLI. (Rhin. Pl. III., éd. 3me); but as compared with that it yields the following measurements:—From *b* to *d* as in fig. 9, 7· inches; from *a* to *b* 6·1 inches; from *d* to *a* 6· inches; greatest expansion under the neck, 7·2 inches; transverse diameter of head, 4· inches.

The hooked process below the expansion is present in this specimen, but all the rest of the shaft is broken off. There are some metatarsal and metacarpal bones, but of the radius and ulna and scapulæ there are only fragments, not sufficiently perfect for description. Cortesi mentions having discovered in another place the humerus of a Rhinoceros, covered with oyster-shells growing upon it. One of these humeri, nearly entire (the lower articular head being wanting), is still in the collection, and the transverse expansion, where greatest below the articular head, measures only 5·6 inches. It is evidently of an adult animal, as the epiphyses are united; the bone is impregnated with iron, and in a very different mineral state from the other decomposed humerus above measured, and it yields dimensions which are so much less than that of the other above given, that it probably belonged to a distinct species, and that species *Rhinoceros Etruscus*. But I have no time at present to determine that point accurately. This completes all that I can do about the Cortesi Rhinoceros.

In the same case are seen the remains of the palate of the *Elephas meridionalis*, figured by Cortesi. The teeth are the last true molar of either side; that of the right side is entirely exposed, showing twelve ridges with a talon plate behind, and also a front talon. Of these, the front five ridges are more or less worn; the enamel-plate is thick; the discs wide apart and little undulated, with thick ringed digitations. The tooth measures in extreme length 11 inches, and the greatest width of the crown is 4½ inches. Alongside of it is the fragment of an enormous ivory tusk, somewhat oval in section, the greatest diameter of which yields 9½ inches. In the same case there is a portion of a most enormous sacrum, attached to the last lumbar vertebra. Among the Elephants' teeth, upper and lower, in this case, I could detect no indications of *Ele-*

phas antiquus. There is a large collection of Elephant bones in another compartment, some of them exhibiting enormous dimensions.

Memo.—Cornalia has shown me the posterior fragment of an Elephant's molar, found in the deposit above the lignite of Leffe (Gandino). It consists of the last three ridges of the last true molar, lower jaw, right, together with the talon, of undoubted *Elephas meridionalis*. The ridges are worn, but the talon intact. It is a characteristic example of *E. meridionalis*, with very thick enamel, and thick cylindrical digitations. It is nowise tinted black, and is stated to have been found above the lignite. Another fragment of molar, found at the same place, appeared to me to be of *Elephas antiquus*; it was in the same white untinted condition. Besides these, from the lignite of Leffe itself, Cornalia procured a worn-out fragment of a large lower molar of an Elephant. It is difficult to say what the species is, the enamel-plates being too thick for *E. primigenius*, and too thin for *E. meridionalis*. It is probably either of *E. antiquus* or *E. Armeniacus*; the discs show very little undulation of the enamel-plates, but the crown is especially remarkable in having the discs separated by a longitudinal fissure (filled up with cement) like the singular Elephant's molar from Durdham Down, which I observed in the Museum at Bristol. Besides these, some lower teeth of *Rhinoceros* were found in the lignite; one of these is an entire penultimate true molar, slightly worn, and of the right side, exactly resembling in every respect the corresponding tooth in Cortesi's lower jaw. It is free from cement, and from the surface rugosity, observable upon the enamel of *Rhinoceros tichorhinus* and *Rhinoceros hemitœchus*. It is certainly not of *R. tichorhinus*, and I believe it to belong, like the Cortesi cranium, to *Rhin. leptorhinus*. Cornalia has also procured molar teeth and fragments of antlers of small Deer, and some molars with a long intercolumnar pillar and prismatic form, which I regard as being of a small species of *Bos*. Lately he has acquired from the same lignite deposit some molar teeth and casts of incisors, which he finds it impossible to distinguish, whether by size or pattern of crown, from the existing Beaver, *Castor Europæus*. They are not of *Trogontherium*.

The Abbate Stoppani regards the deposit as being a late quaternary, Gandino being a spot below the horizon, to which the moraines of the southern glaciers of the Alps in Lombardy extended. On the other hand, the vertebrate remains, exclusive of the Beaver, appear to me to indicate a Pliocene age. A fragment of a Mastodon's molar, tinted black, is supposed to have come from the same deposit; but there is no certain record of its origin, and it cannot be relied upon. Nuts of a walnut of a very elongated form are very abundant in the same lignite; and one of them was got along with the Elephant's tooth. The species has been named *Juglans Berchenensis*? or some such name, by Balsamo Crivelli. The occurrence of the Beaver's teeth in this case is very remarkable, and singularly so, should it really prove to be the existing species.

Dimensions of the Cortesi Rhinoceros Skull.—1. Extreme length of skull from broken summit of occipital crest to point of the nasal bones, 28·25 in. 2. Extreme ditto from the posterior plane of occipital condyles to broken edge (anterior) of left diasteme, 27·25 in. 3. Extreme ditto from ditto, ditto, to anterior edge of alveolus of first premolar (left side), about 25· in. 4. Extreme length from anterior margin first premolar to posterior edge of last true molar, left side (last molar included in alveolus), 13· in. 5. Length of last three molars, left side, 6·7 in. 6.

Extreme length of first and second true molars, left side, 4·6 in. 7. Length of last three premolars, right side, 5·6 in. 8. Length of four premolars (to anterior margin of empty alveolus of first ditto, right side), 6·1 in. 9. Length of remaining portion of diasteme, left side (measured from anterior margin of first alveolus), 2·2 in. 10. Transverse diameter of empty alveolus of first premolar, right side, ·8 in. 11. Antero-posterior ditto of ditto, ·5 in. 12. Length of second premolar, left side (crown of tooth broken on right side), 1·95 in. 13. Transverse diameter of ditto near base, behind, 1·7 in. 14. Antero-posterior diameter of third premolar (left side), about 2·1 in. 15. Transverse diameter of ditto at bourrelet (base), anterior barrel, 2·4 in. 16. Antero-posterior diameter of last premolar, right side, outer surface (corresponding tooth, left side, broken off, and place occupied by matrix), 1·8 in. 17. Transverse diameter of ditto at base, anterior barrel, 2·25 in. 18. Length of crown of first true molar, outer surface, left side, 2·3 in. 19. Transverse diameter of anterior barrel of ditto (left side), near base, partly concealed by matrix, about 2·4 in. 20. Antero-posterior diameter, outer surface, penultimate molar, right side (crown shivered on left side), 2·4 in. 21. Interval between diastemal ridges at commencement, near first premolar, 2·85 in. 22. Length from anterior border, right orbit, to outer edge of cast of occipital plane, right side, about 16·0 in. 23. Length from ditto, ditto, to tip remaining of nasals, 13· in. 24. Length from posterior plane of occipital condyles to posterior margin of last true molar, about 13· in. 25. Diameter between outer margins of occipital condyles, 6·4 in. 26. Transverse diameter, right condyle, taken near the middle, 2·2 in. 27. Vertical height of ditto, 2·6 in. 28. Diagonal diameter of ditto (greatest), 3·2 in. 29. Width of occipital foramen (greatest), about 2·5 in. 30. Height of occipital plane to lower surface of occipital condyles, 10·5 in. 31. Greatest width of occipital plane just above the condyles, 9·1 in. 32. Greatest width of ditto about middle, 7·2 in. 33. Length of zygomatic fossa, left side, 5· in. 34. Length from the posterior boundary zygomatic fossa to the posterior surface of the occipital condyle, left side, about 8·6 in. 35. Extreme length from the tips of the incisive to the broken edge of the occipital crest, left side, measured as a straight line, 28·75–29 in. 36. Extreme ditto from the anterior margin of the orbit, right side, to the tip of the nasal, 13· in. 37. Extreme ditto, ditto, ditto, left side, to the broken edge of the occipital crest near the left summit, 16·75 in. 38. Length (versed sine) of cord stretched from greatest convexity of nasals to summit of occipital crest where slightly broken, left side, taken on plateau between the orbits, 2·3 in. 39. Length of ditto, taken at constriction of frontals between the zygomatic arches, 3· in. 40. Length from the posterior surface, occipital condyles, to tip of the nasals (a long curve), 31· in. 41. From tip of the nasals to lateral margin of occipital ridge, above the left auditory foramen, 26·5 in. 42. Length from anterior margin auditory foramen to anterior margin of the orbit, 12· in. 43. Thickness of the nasal bones taken at the middle, 1·4 in. 44. Width of ditto, ditto, 4· in. 45. Greatest contraction of the cranium between the zygomatic fossæ, 5·5 in. 46. Height of the occiput above the lower plane of the occipital condyles (occipital crest partly broken), 10·5 in. 47. Height of jaw from edge of third premolar to convexity of nasals, left side, 10·7 in.

Measurements of Lower Jaw of Cortesi's Rhinoceros.—1. Extreme length from posterior margin of ascending ramus to broken edge of incisive beak, right side, 23·25 in. 2. Length of edentulous beak from beginning of diasteme, 3·25 in. 3. Width of symphysis at contracted portion at commencement of diasteme, 2·7 in. 4. Length of line of molars, left side, as visibly exposed, 9·6 in. 4. Length of ditto, right side, ditto, 9·6 in. 5. Antero-posterior length, right side, of ascending ramus above alveolar level, 6·3 in. 6. Height from posterior angle to middle of sigmoid notch, 9·7 in. 7. Length of two last molars, left side, 4·3 in. 8. Length of anterior two, ditto, 3·1 in. 9. Length of gap between, 2·2 in. 10. Length of last exposed molar, left side, 2·2 in. 11. Length of penultimate ditto, ditto, 2· in. 12. Length of anterior molar, ditto, 1·3 in. 13. Length of second ditto, ditto, 1·6 in. 14. Height of jaw at contracted part of symphysis, 2·2 in. 15. Height of jaw to alveolar margin between first and second molars, right side, 3·6 in. 16. Interval between the posterior crescents of the last visible molars, 4·4 in. 17. Interval between the anterior edges of p.m. 2, inside, 2·7 in. 18. Interval between p.m. 3, inside, posterior margin, 4· in. 19. Interval between anterior ends of t.m. 1, 4·9 in. 20. Ditto between posterior crescents of t.m. 2, inside, 4·4 in. 21. Height of jaw to margin of alveolus of antepenultimate premolar, right side, 2·5 in.

X.—Description of Lower Jaw of Rhinoceros Leptorhinus figured by Cortesi.[1]

London, October 13, 1862.

The description which follows is believed by me to be of the missing lower jaw of Rhinoceros figured by Cortesi, and which Capellini tells me was discovered, since my visit, in a box at Parma, by Strobelli.

Among the marbles and polished stones of the Italian Court in the London Exhibition of 1862 are two rami of the lower jaw, evidently right and left of the same individual, of a fossil Rhinoceros, believed to have been sent by Professor Scacchi of Naples. The left side is entire from the ascending ramus to the symphysial margin, the condyle alone being wanting. On the right side the anterior part of the ramus, as far as the third premolar, has been crushed by a recent injury. The jaw is evidently that of an adult animal, with six molars *in situ*, all of them fully in wear, but the abrasion of the crown of the last true molar is not very far advanced. There are six molar teeth out, but no appearance of the socket of the pre-antepenultimate or first premolar. The symphysial beak is perfect on both sides, with a very short diasteme, which shows a doubtful trace of a socket for an incisor.

Dimensions:—

Length of the line of six molars, 9·25 in. Joint length of three true molars, 5·1 in. Ditto of three premolars, 3·9 in. Length of crown of last molar, 1·7 in. Greatest width of ditto, 1·1 in. Length of penultimate, summit of crown, 1·7 in. Greatest width of ditto, 1·2 in. Length of antepenultimate, 1·6 in. Length of last premolar, 1·4 in. Ditto of penultimate ditto, 1·3 in. Ditto of antepenultimate ditto, 1·05 in. Ditto from anterior edge of antepenultimate premolar to incisive border, 1·7 in. Ditto of diastemal ridge, 0·65 in. Height of ramus under penultimate premolar, 2·4 in. Ditto at middle of last true molar, 2·9 in. Greatest thickness of ramus (about), 2·1 in.

The first premolar is not very far advanced in wear, the anterior part of its crown being still intact; the penultimate is further advanced, having both barrels worn so as to have confluent discs. The last premolar is nearly in the same state of wear, but less advanced. The first true molar is worn very low into a uniform sinuous depressed disc. The second is less worn, showing a horse-shoe pattern to the front division, confluent with a simple *cornu* to the hind division. The last molar has the anterior and posterior discs quite distinct and at different levels, the anterior one showing a disc of a form between a sagittate and horse-shoe pattern; the hinder disc forms a narrow band, but slightly curved into a kind of clavate form and at a much lower level than the anterior. Regarded from the outer side, the anterior barrel of the last true molar and of the penultimate shows distinctly the oblique crenate bourrelet indicated by De Christol in his *R. megarhinus*. On the right side the same bourrelet is shown on the premolars still more distinctly. The enamel surface is comparatively smooth, as in *R. megarhinus*, and perfectly free from the reticular inequalities so boldly shown in *R. tichorhinus*. On the inner side it is perfectly smooth and shows occasionally the parallel lines characteristic of *R. megarhinus*

[1] This is evidently a different lower jaw from that already described.—[Ed.]

and *R. Etruscus*. The symphysial part of the jaw and the diasteme, in their sudden abbreviation and general contour, remind me very closely of Gervais' drawing of *R. megarhinus*. Unluckily the lower surface of the symphysis is either broken or covered by matrix, so as to conceal the character there yielded by the foramina.

The left ramus on its outer surface is distinctly covered by sea-shells, some of which are of a Patella-looking form. The lower border of the ramus is nearly in a horizontal line from the posterior angle, as far as the last premolar; it then curves gently forwards to rise suddenly upwards into the beak, in a line with the anterior edge of the ante-penultimate premolar. On the whole, I am satisfied that the specimen belongs to *R. megarhinus* (*R. leptorhinus*, mihi.)

The outer surface of the ramus is convex, but the inner is flat, with a broad longitudinal shallow channel. The teeth appear to have been covered with a considerable coat of cement. On the right side, at the middle of the diasteme, and about half way into the incisive border, there is an indistinct appearance of a triangular pit, as if the residuary socket of a small shed tooth; there is no such evidence on the left side, in consequence of a layer of matrix.

XI.—Rhinoceros Leptorhinus at Pisa.

May 22, 1859.

The Rhinoceros specimen from the Ardenza bone-breccia, containing the antepenultimate and penultimate true molars, left side, is not of *R. hemitœchus*, but of *R. megarhinus*.

XII.—Description of Remains of Rhinoceros Leptorhinus in the Museum at Imola.

May, 1861.

Came on last evening by Faenza from Ravenna, and went out this morning at 5 A.M., with Signor Scarabelli the Syndic, and Capellini, to see the locality where the Rhinoceros bones, &c., in the Museum were found. Drove about due S. parallel to the Santerno, towards the hills; crossed the river, and then entered a small valley, that of the 'Rio dell' Acque Marine,' where the proprietor, Signor Cerchiani, a friend of Scarabelli's, had collected through the villagers the Rhinoceros and other bones. The sections are beautifully shown, somewhat as in the Sewalik-hills.

1. Uppermost yellow quaternary loam or lehm.
2. A thick bed of stratified gravel in a hard sandstone cement, quaternary.
3. Thick beds of yellow sand, containing *Cardium edule*, &c., with occasional seams of gravelly conglomerate.
4. Blue clay, containing walnuts with elongated fruit, the same as those at Milan (p. 391). Saw nothing exactly corresponding to the Sansino beds of the Val d'Arno.

Signor Cerchiani had the bones collected for him by the contadini, who found a superb skull of a fossil Rhinoceros and broke it into bits to get their separate reward for each piece, a baiocco per fragment! Scarabelli repaired the broken teeth, and has fitted the whole series of either side very cleverly into separate slabs of plaster of Paris, exactly in their

natural position, including the six molars of each side from the antepenultimate premolar (p.m. 2) to the last true molar (m. 3), inclusive. (See Plate XXXI. fig. 1.)

The molars (see Plate XXXI. fig. 1), on the whole, are admirably preserved, better even than the Bologna specimen of *R. Etruscus* (Pl. XXIX.), and in a beautiful state, so far as age goes, to show the dental characters, t.m. 2 being about half way worn above the basal bourrelet, and t.m. 3 with its apex only partially worn; p.m. 4 and t.m. 1 of either side much worn.

The following are the principal dimensions on right side:—

Extreme length of line of six molars from hind tubercle, last molar, to antepenultimate p.m. 10·6 in. Length of three true molars outside, 6·2 in. Ditto in middle, 5·8 in. Ditto of three premolars, 4·9 in. Length of p.m. 2, top, outside, 1·55 in. Width of ditto, greatest, 1·6 in. Length of p.m. 3, 1·8 in. Width of ditto greatest (below bourrelet), 2·2 in. Length of p.m. 4 ditto, 1·9 in. Width of ditto (greatest in front), below ditto, 2·3 in. Length of t.m. 1 (greater on left side, but restored), about 2· in. Width of ditto in front (bourrelet worn away), 2·45 in. Length of t.m. 2, which is very perfect, 2·3 in. Width of ditto in front, below bourrelet, 2·5 in. Length of t.m. 3 diagonally from anterior angle to basal tubercle, 2·3 in. Width of ditto at base of front barrel, 2·25 in.

General Remarks.—1. The first point that strikes is, that the three premolars have a very large basal cingulum, quite as large as that figured by Christol. It is largest in the third and fourth, and very oblique in its direction, rising gradually from the base of the anterior barrel to the top, behind, of the posterior barrel (*i.e.* from the anterior talon to the edge of the hind valley).

2. The true molars have also a very distinct basal cingulum (!). This is nearly worn away in the antepenultimate, but is shown in very bold relief upon the anterior barrel of the penultimate, and interruptedly, but quite clearly, on the posterior barrel. The same cingulum is shown very boldly on the anterior barrel of the last true molar, but is not exhibited on the posterior barrel of this tooth, which is narrow at the base.

3. In lieu of the rudimentary pit on the hind part of the base of the last true molar, which is seen in the *R. Etruscus* of the Bologna Museum, the Imola tooth (t.m. 3) shows a distinct triangular or sagittiform lobe or tubercle (like a Celtic arrow-head), adpressed to the posterior barrel, but separated from it at the apex by a very pronounced notch. This tubercle is somewhat crenated at the apex, but utterly distinct in form from that of *R. Etruscus* or *R. hemitœchus*. There is not a trace of a posterior valley running up upon the posterior angle of the last molar.

4. The vertical external furrow of the anterior angle is broad and very boldly defined by a deep groove in all the true molars, and also in p.m. 4. This is shown also in p.m. 3, but less boldly. In this respect the teeth are very different from those of *R. Etruscus*. The other ridges and furrows of the outer surface are also shown more distinctly in the Imola specimen than in *R. Etruscus*.

5. There is not the least indication of a basal bourrelet outside (as in *Aceratherium*).

6. The crochet in t.m. 2 makes an obvious angle with a re-entering nick in its offset from the posterior barrel; the angle is much more

pronounced than in the *nickless* very open angle of *R. Etruscus*, but does not form the right angle of *R. hemitœchus*.

7. P.m. 2 is about half worn, and has its anterior barrel much smaller than the posterior, like a compressed conical cup as in Gervais's figure; there are no accessory plates, but a distinct ring isolated on the base of the crochet.

8. P.m. 3 is much worn; the accessory plates are ground away, with only a sinuous outline.

9. P.m. 4 shows the same characters, but is still more worn.

10. T.m. 1 is ground down to the cingulum; the inner termination of the transverse valley shows a 'duck's-head pattern,' as in Gervais' drawings; the crochet is short and very thick.

11. T.m. 2 is in the finest condition, only about a third worn; the posterior valley is not touched behind; the crochet is thick and forms a nick at its offset, but at an open angle. There is a peculiar twist of the posterior barrel at the apex. The anterior transverse valley has a wide triangular fissure at its central termination; there are no combing plates, but there is a pillar of enamel rising in the middle of it, evidently given off from the outer ridge.

12. The last molar, as usual, is triangular, but is little worn; its anterior barrel is very broad; the posterior is narrow. There is no rudiment of a posterior valley; the middle valley is triangular, with one large combing plate converging from the outer ridge towards the crochet; there is also a similar accessory plate sent off from the anterior barrel to overlap the crochet; the three processes forming three distinct converging intrusions into the outer termination of the transverse valley.

In the Imola Museum, from near the same locality in which the skull was found, but not exactly from the same deposit, there are two rami of a jaw, each portion containing the series of molars from the second premolar to the last true molar, beautifully preserved.

Both rami are fractured anteriorly in a line with the fangs of the second premolar, and they are likewise broken posteriorly in the middle of the ascending ramus.

The lower margin is perfectly entire, but unfortunately the symphysial portion and mentary process are missing.

Dimensions on right side:—

Length of the last six molars, 8·5 in. Length of the last three true molars measured from the middle of the crowns, 5· in. Ditto of crowns of the three premolars, 3·5 in. Ditto of the last molar, 1·8 in. Ditto of the penultimate, 1·65 in. Ditto of the antepenultimate, 1·4 in. Ditto of the fourth premolar, 1·25 in. Ditto of the penultimate premolar, 1·1 in. Ditto of the antepenultimate premolar, 1·05 in. Height of the jaws between the antepenultimate and penultimate, up to the alveolar margin, 2·3 in. Height from the middle of the last molar to the alveolar border, 2·7 in.

The crowns of all the teeth are somewhat worn, *i.e.* the animal was an adult, but not old. Several of the molars of this specimen show the small characteristic *bourrelet*, which has been indicated by De Christol.

There is also a third jaw specimen—a left ramus—very well preserved, in which the molars are less worn than in the two preceding. This specimen is broken vertically in front of the penultimate premolar, and therefore exhibits only the last five molars.

Length of the last five molars, 8·2 in. Ditto ditto of three last true molars, 5·3 in. Ditto ditto of two premolars, 2·8 in.

This specimen is fractured anteriorly and posteriorly like the other two; the symphysial portion is missing. The crowns of the molars are very little worn, and are beautifully preserved; the transverse bourrelet of the outer side is well shown at the two extremities of the penultimate true molar, and is crenated. The same character is seen in the anterior portion of the last true molar, less so in the antepenultimate, and still less in the last premolar. The margin of the ramus in this specimen is exactly equal to that of the other two fossils; it belongs like them to the same species, to which the skull must also be referred, *i.e. R. leptorhinus* (Cuv. *pro parte*), *R. megarhinus* (Christol). Of the detached molars, of which there is a large number, all exhibit the characters of *R. leptorhinus*; not one can be referred to *R. Etruscus*.

There are two specimens of the last true molar, upper jaw, one right, the other left, both showing the posterior lobe, instead of the fossette as in *R. Etruscus*.

In one of the specimens, that of the right side, the crochet forms a connecting bridge, extending between the anterior and posterior portions.

XIII.—Description of Remains of R. Leptorhinus in the Scortegagna Collection at Vicenza.

May 31, 1861.

In this collection there is a lower jaw, right side, of a fossil Rhinoceros found in an osseous breccia, which corresponds exactly with the ordinary breccia of ossiferous caves. The jaw is fractured and covered with a matrix, crammed with fragments of bone. The six last molars are seen; in the first of these the crown is wanting, but the two fangs remain; the last is displaced. The first true molar exhibits De Christol's transverse bourrelet, and from all the characters it appears to me that the specimen belongs to the *R. megarhinus* of Montpellier.

Dimensions:—

Length from anterior part of penultimate premolar, to posterior portion of penultimate true molar, 7·2 in. Ditto of penultimate true molar, 2·(?) in. Ditto antepenultimate ditto, 1·75 in.

In the same collection there is shown the corresponding ramus perhaps of the same animal, with four teeth *in situ*, the last of which is very little worn. There is also a mass of matrix, containing *Cyclostoma elegans*, and several other molars of the same species of Rhinoceros, but so involved in the matrix that their crowns are not well seen.

The crown of the last true molar is worn to the middle, and has an artificial outline of wax round the posterior portion, so that all the characters cannot be seen. From what is exhibited, the specimen appears identical with *R. megarhinus*.

There is also a radius of Rhinoceros (*leptorhinus*?). The lower part is entire, but the head is wanting, and the bone is broken in several places, so that the distinctive characters are not recognizable. It is described as a tibia of Hippopotamus.

XIV.—Note on Molars of Rhinoceros Leptorhinus (R. Merckii, Jäger), in the Museum at Stuttgart.

June 18, 1861.

Got casts of the three molars upon which Jäger founded his *R. Merckii* of Kirchberg. Dr. Fraas told me that the real history of the discovery of these specimens is involved in obscurity. They were shown to Jäger by the Prince of ——, residing near Kirchberg, and no additional specimens have turned up from that quarter. The two upper teeth are the penultimate and last, evidently of the Grays Thurrock species, *R. leptorhinus* (*R. megarhinus*). The original penultimate is in very fine preservation. [Figures of two of these casts, executed by Mr. Dinkel, will be found in Plate XXXII. figs. 1 and 2.—Ed.]

XV.—Memo. of Rhinoceros Leptorhinus from the Forest-bed.

August 25, 1863.

In Mr. Gunn's collection there is a very fine specimen of the last premolar, upper, right, of *R. leptorhinus* (*R. megarhinus*), which shows the characters perfectly and is a certain proof of *R. megarhinus* from the Forest-bed. [The characters are described in detail and are shown to differ from those of *R. Etruscus*. In a letter to M. Lartet, dated June 25, 1863, Dr. F. also remarks:—'The *Rhinoceros leptorhinus* of Grays Thurrock occurs elsewhere in England in a peat-bed, which is *below* the *loess*, along with *Elephas primigenius*.'—Ed.]

XVI.—Note on Remains of Rhinoceros Leptorhinus (R. megarhinus), in Dr. Spurrell's Collection at Belvedere.

Sept. 30, 1863.

There are four detached upper molars belonging to this species. One is a last true molar (t.m. 3), right side, in the finest preservation, and only slightly advanced in wear. In its transverse diameter from the outer angle to the inner side barrels, it agrees very closely with the Montpellier cast brought for comparison, but the width is considerably less; it shows no indication of any rudimentary basal valley behind. Another specimen of the same species is a penultimate upper left molar, which agrees in the most surprising manner in form, size, stage of wear, and hook of the posterior barrel with the *R. Merckii* cast from Stuttgart, which was brought for comparison with it. Dr. Spurrell and Messrs. Woodward and Prestwich were struck with the identity. With regard to mineral character the four teeth of *R. megarhinus* present a tint which seems to me to differ a little from that shown by the *R. tichorhinus* (see page 401), while the latter have besides a rough and rolled general character which is not so obvious in the former. On the other hand, Prestwich considers that there are three teeth of the *R. tichorhinus*, which, in mineral character, closely resemble the *R. megarhinus*, whilst the slight difference in tint may arise from difference in the facility with which the different species stain! the matrix being in both cases alike—sand with green grains of flint pebbles. He admits, however, that it is a case for inquiry.

XVII.—Note on Remains of Rhinoceros Leptorhinus in the Museum of Le Puy, Auvergne.

Sept. 15, 1863.

Examined a fine specimen of left side of lower jaw of *R. megarhinus* from Solilhac (said by M. Robert to have been found along with the bones of the skeleton which I have attributed to *R. Etruscus*!). It has the six molars *en suite*, the last but little worn. The outer side of the angle has the deep rugosities exhibited by Gervais' figure. Length of four last molars, 6·5 in.

In the same Museum there is also a magnificent palate series of *R. megarhinus* (*Merckii* pattern), according to M. Robert, found in 'des fentes à ossements éruptives du collet Polignac.' It contains the six last molars on both sides, all a little worn. Length of six molars, 11 inches.

The teeth are very finely preserved, and exactly like the large Grays Thurrock specimen in the British Museum; they are very fresh and modern looking.

IV. NOTES ON RHINOCEROS ANTIQUITATIS (Blumb.) R. TICHORHINUS (Fisch. and Cuv.).

I.—Rhinoceros Antiquitatis from Wookey Hole, Taunton, and Uphill Cavern.

Taunton Museum, April 13, 1858, *and Bristol, May* 1858.

Examined upper and lower molars of *R. tichorhinus* from Wookey Hole, a lately discovered cave in the Mendip Hills. From the same cave there are molars of *E. primigenius*, a magnificent canine of the Cave Lion, remains of Hyæna, &c.

In the same Museum there is a skull of a *R. tichorhinus*, three-fourths grown, found in digging the foundation of the jail. It contains on either side the five posterior teeth, the penultimate and last in germ, and the last not fully emerged from the alveolus. There are also numerous detached teeth of the same species.

In the Bristol Museum are two lower molars of *R. tichorhinus* from Uphill Cavern, very pronounced by their rugosity.[1]

II.—Comparison of Mr. Boyd Dawkins's Specimens of Rhinoceros Molars from Wookey Hole.

March 25, 1862.[2]

They consist of two milk molars, probably from the dimensions penultimates (m.m. 3) of the upper jaw, the one (10 D) of the left side, the other (10 A) of the right; 10 A is considerably more advanced in wear than the other. There are three insulated valleys; first, there is a fissure formed by the great transverse valley, the opening of which is blocked up by a much higher step than in the same teeth of *R. hemitœchus*, in this respect agreeing with *R. tichorhinus*. There is no basal bourrelet at the inside, but in this case a small and

[1] Dr. Falconer also identified specimens of *R. hemitœchus* from Wookey Hole. In a letter to Col. Wood, dated July 8, 1862, he wrote: 'Mr. Dawkins lately got veritable *R. hemitœchus* from Wookey Hole.'—[Ed.]

[2] In the same year Dr. Falconer identified remains of *R. tichorhinus* in collections from Kent's Hole at Torquay.—[Ed.]

rather pointed tubercle is appended to the posterior barrel. The second valley is formed by the confluence of the combing processes; it is very round and insulated, with vertical walls differing from all Colonel Wood's Gower specimens. The posterior valley is also insulated all round, with rather vertical walls. The vertical furrows upon the outer surface are well pronounced; the enamel surface, especially at the ends, is decidedly rugous; there are three fangs. I have compared it with the drawings of Colonel Wood's specimens of *R. hemitœchus*, and with the small 'Long Hole' milk molar, from all of which it is decidedly different. The smoothness and thinness of the enamel in the latter is strongly pronounced. In the form of the fissure, in the roundness of the small valley, and in the enamel surface, it closely agrees with the still more worn milk molar of *R. tichorhinus* from 'Long Hole,' Gower, and I infer it to be of *R. tichorhinus*.

10 D. resembles 10 A. very closely in all its characters, but is considerably less worn, and it shows large fangs. The large transverse valley forms an isolated fissure, with a high step blocking up its opening as in *R. tichorhinus*, but there is no tubercle. The small middle valley is a round ring with vertical walls, but not quite insulated on its inner side, there being a narrow cleft between the combing processes. The posterior fissure forms a deep and rather vertical pit, the edge of which is intact behind. In the characters of enamel surface, and outer vertical furrows, it agrees entirely with 10 A. The posterior fissure in the 'Long Hole' (Gower) specimen is much more gaping and triangular in its marginal outline, and very much more depressed at its hind border. I believe Mr. Dawkins' specimens to be of *R. tichorhinus* and not of any form of *R. leptorhinus*. The *R. megarhinus* has far more combing plates.

III.—Memorandum of Fragment of Lower Jaw of Rhinoceros tichorhinus, with Milk Dentition, from Wookey Hole.

December 7, 1862.

Mr. Dawkins' specimen is a fragment of the anterior portion of the left side of the lower jaw, containing the first three milk molars *in situ*, with about one inch of the diastemal and symphysial portions; the last milk molar (m.m. 4) is wanting. With this exception, the Wookey specimen resembles in the very closest manner the Lawford specimen figured by Owen in the 'Brit. Foss. Mam.', pp. 338 and 363, Cuts 128 and 137. The m.m. 1 is all but intact at the apex of the cusp. The m.m. 2 has the middle cusp and posterior crescent slightly abraded, but the anterior edge is intact; m.m. 3 has both crescents slightly abraded.

M.m. 1 in form is exactly like p. 1 of Cut 137, and m.m. 2 like p. 2, both of natural size and seen from inner side, the latter showing the double cusps of the middle more pronounced.

The diastemal portion, which is shown entire for about ·6 of an inch, is very rounded. The enamel is rugous and there is no cement. The jaw is low and the inferior edge is rounded forwards, and very broad and flat. There is not the least appearance of incisors or their pits. There is one large mentary foramen, at about $\frac{3}{4}$ of an inch in front of the anterior (m.m. 1) tooth, at about the middle of the height of the jaw.

The following are the principal dimensions:—

Length of fragment, 4·6 in. Joint length of three milk molars, 3·1 in. Length of m.m. 1, 0·7 in. Ditto of m.m. 2, 1·0 in. Ditto of m.m. 3, 1·3 in. Height of jaw under m.m. 1, inside, 1·6 in. Ditto at hinder end of m.m. 3, 2·0 in. Greatest thickness of ramus below, at section, 1·5 in.

The jaw at hind section is gnawed, but not deeply scored, as if by *Hyæna*.

This specimen confirms my former doubts,[1] that the Lawford specimen has the milk dentition, and not the permanent, as described in the 'Brit. Foss. Mammalia.'

IV.—Memorandum of Skulls of Rhinoceros Antiquitatis in the Stuttgart Museum.

June 18, 1861.

Saw two skulls of *Rhinoceros tichorhinus*, found in the *Lehm*, near Stuttgart; one of them very large but somewhat crushed. The molars, lower jaws, and other bones of this species, are very numerous. Looked over the whole of them, but saw nothing in the slightest degree resembling either *Rhinoceros hemitœchus*, *Rhinoc. leptorhinus*, or *Rhinoc. Etruscus*. (See *antea*, p. 398.)

V.—Molars of Rhinoceros Antiquitatis in the Collection of Dr. F. Spurrell, Belvedere.

September 10, 1863.

Of *Rhinoceros tichorhinus* there are fourteen characteristic and well-marked detached upper molars, including a pair of last (m. 3) of opposite sides. They are all highly characteristic specimens of the species, *i.e.* the enamel is thick and rough, and the valleys are three and vertical. They are in a ruder state and appear to have been rolled or tumbled about much more, than the *leptorhine* molars in the same collection. Woodward, Prestwich, and myself are agreed upon this. (See *antea*, p. 398.)

VI.—Memo. of Rhinoceros Antiquitatis in Mr. Grantham's Collection.

September, 1863.

Posterior part of the cranium of *Rhinoc. tichorhinus*, including nearly the whole of the occiput with the left condyle quite entire. The occipital crest is perfect, and on the left side the parietal and temporal regions, with the auditory foramen and the styloid process, are nearly perfect. The skull, *in situ*, was probably entire. There are also several fragments of the upper jaw containing teeth. One left maxillary contains four molars of an adult animal *in situ*. The teeth show distinctly the character of *Rhinoc. tichorhinus*. There are no lower jaw specimens, but several detached lower molars. The only remains of *Rhinoc. leptorhinus* in this collection is one molar, very far advanced in wear and very like Dr. Spurrell's (p. 398).

[1] Expressed in Note-books after examination of the Lawford and Wirksworth Jaws of *R. tichorhinus* in the Oxford Museum in 1858. See also *antea*, p. 348.—[Ed.]

VII.—Memo. of Jaw and Molars of Rhinoceros Antiquitatis in the Museum of Le Puy.

September, 1863.

Examined a lower jaw, left side, broken in front and behind, of *Rhinoceros tichorhinus*, and two detached upper and three lower molars of same species, labelled *Rhinoc. Mesotropus*, by Aymard, in his handwriting. The jaw is youngish and contains the last five molars *in situ*, the last not quite emerged. There is also a block of plaster of Paris containing four molars, not consecutive, of upper jaw, right side (*i.e.* two true molars and two premolars), named *R. Mesotropus* in Aymard's handwriting. According to Aymard, both *R. megarhinus* and *R. tichorhinus* belong to his *R. Mesotropus*. The specimens are from 'Attérissements de Paradis près Espaly.'

VIII.—Note on Specimens of R. Antiquitatis in Maidstone Museum.

September 28, 1863.

In this collection I found five upper molars of *Rhinoc. tichorhinus*, from Stroud; six upper molars, including two fine last upper, from the brick-earth at Thornhill, at back of Maidstone Jail, one of which is very remarkable and ought to be figured; the lower end of a right humerus from Burham; and the fragment of a tooth, far advanced in wear, from the railway cutting near St. Peter's Church.

NOTES ON DENTITION OF LIVING SPECIES OF RHINOCEROS.

I.—Note on Rhinoceros Keitloa.

Saffron Walden, October 8, 1861.

The Saffron Walden Museum contains a beautifully perfect skeleton of an adult Rhinoceros, got at the same time as the Elephant from Algoa Bay (see *antea*, p. 265), but the ticket indicating South Africa. It bears the name of *Rhinoceros camus* or *R. simus* of Burchell.

In the upper jaw there are seven molars all protruded, but the last true molar barely touched by wear. There are four premolars and three true molars. The premolars are surrounded by a distinct basal cingulum; but in the progress of wear only two pits have been left, and the form of the crown is exactly that of the two-horned Rhinoceros of Sumatra, and totally different from the Tichorhinus pattern. Unfortunately the two intermaxillary bones have been lost or omitted in mounting the skeleton, but it is apparent that there was a short diastemal edge in front of the first premolar.

As regards the lower jaw the dentition is quite complete. There are four premolars and three true molars, all of them affected by wear, except the last. The first premolar has a flattened crown, with a single fang, and is of moderate size, immediately in front of which is the nearly filled up alveolus of an outer incisor which had been shed, and of which the fang-pit is in progress of filling up. Inside of it there is, on either side, and immediately contiguous to it, the pit, nearly eradi-

cated, of a rudimentary incisor. There were, therefore, *four incisors* below, deciduous in the adult animal, and which were in immediate contiguity with the molar series without the interruption of a diasteme. On the whole, the dentition of this skeleton reminds me very much of that of the adult *Rhinoceros bicornis* of Africa.

There is one peculiarity in the skull deserving notice, viz. that while the suborbital foramen on the left side is single, on the right side there are distinctly three foramina disposed in a triangle. The skin of the same skeleton has been mounted, forming a very fine specimen. It presents two horns, of which the nasal is 27 inches long, and 18½ inches in girth at the base. The posterior horn is contiguous at the base with the anterior. It is of large size, measuring about 13 inches in height and 17½ inches in girth at the base. On referring to the excellent figures in Anderson's 'Lake Ngami' (p. 386), it would seem that the Saffron Walden skeleton is a *R. Keitloa*, both horns being of considerable length; in Anderson's figure they are subequal.

II.—Note on Rhinoceros camus.

In the same Museum there is also a skeleton of a little *Rhinoceros camus*. Both jaws show seven molars on each side, the seventh in the upper jaw being barely out. The front of the lower jaw shows the pits of four incisors which had fallen out, the pits being nearly filled up; the two outer are large, the two inner small. The alveolus of the outer incisor is overarched by the first premolar, there being only two lines of interval.

III.—Note on dentition of Rhinoceros bicornis.

Leeds, July 17, 1858.

In the Natural History Museum there is a very fine skull of *Rhinoceros bicornis* in the best possible age for the comparison of the dentition, but it has no lower jaw. All the permanent teeth are in place; the premolars are well worn, and the last molar is just worn sufficiently to show the pattern perfectly. The 3rd right premolar has three distinct fossettes, and the 2nd, 3rd, and 4th have a distinct basal bourrelet on the inner side very salient and marked, and continuous with the anterior and the posterior bourrelet. There is no inner bourrelet to the three last molars. The last molar has an interior bourrelet, but only one or two warty tubercles posteriorly. The posterior barrel is bifurcate. There is a very minute rudimentary incisor in the incisive bone on the right side.