

very puzzling affair, if we suppose these remains contemporaneous with the drift gravel and elephant remains.

I should suppose the drift gravel of the Trent valley was deposited when the waves of a tidal river (possibly reaching as far up as Burton-on-Trent) washed on the one side the Bunter Sandstone, on which stands Nottingham Castle, and on the other the steep slopes of "Clifton Grove," and the long ridge of Triassic hills terminating at Red Hill, depositing the gravels found so abundantly on their northern sides, but that certainly would be an age far, very far back in time, compared with the age of the deposits at Muskham.

Leicester, 15th Oct., 1861.

JAMES PLANT.

FOREIGN CORRESPONDENCE.

Abstract from Professor Suess's Paper

ON THE LARGE CARNIVORA FOUND IN THE AUSTRIAN TERTIARIES.

(Imperial Academy of Sciences, Vienna, Proceedings, Vol. xliii. p. 217,
Meeting, March 7, 1861.)

(TRANSLATED BY COUNT MARSCHALL.)

MANY years before Darwin's celebrated theory came to light, the question whether the repeated changes in animal and vegetable creation were the effects of changes in the external conditions of organic life, had been discussed among many palæontologists.

The solution of this question having to be sought for only within those deposits the Fauna of which is so nearly allied to that of present times that we can hope for a rather clearer idea of the condition in which these extinct forms were living, I have, a long time ago, been gathering a store of materials for the history of the Vienna Tertiaries, intending, in obedience to Bacon's precept—"Non disputando adversarium, sed opere naturam vincere."

I have now to treat this matter,—first, in its stratigraphical aspect, describing the changes in external physical circumstances, then as a question of palæontology, inquiring into the action of those changes on the organic being coeval with them. I have previously had occasion to publish some result of my investigations in both these directions (see Acad. Proc. 1860, vol. xxxix. p. 158-166); and among the most important of them I may number the separation of the Vienna tertiaries into an Alpine and Extra-Alpine basin; the statement of repeated upheavings, of coevality of the apparently different deposits of Nussdorf, Grund, Baden, &c.; and lastly, the distinction of several successive Faunæ of terrestrial mammalia. Since that time the means liberally afforded to me by His Majesty's Lord-Chamber-

lain's Office,* have enabled me to visit during the summer of 1860 the whole western side of the Vienna basin, and to measure altitudes fit for being made a basis of a tabular synopsis of the bathymetrical distribution of our tertiary marine fauna. M. de Schwabenau having kindly informed me of the discovery of a Tertiary bone-bed at Baltavar (W. Hungary), the Imperial Geological Museum entrusted me with a mission to this place, where, by long-continued diggings, I succeeded in finding, in an horizon which I think answers to the gravel of Belvedere (Vienna), remains of species most characteristic of the well-known Fauna of Pikermi, in Attica,—such as *Machairodus cultridens*, *Hyaena Hipparionum*, *Dinotherium* sp., *Rhinoceros* sp., *Sus Erymanthius*, *Antilope brevicornis*, *Helladotherium Dunerovi*, *Hippotherium gracile*, &c.

A rich collection of Pikermi fossils recently sent to the Imperial Museum by Baron Breuner-Felsach, then His Majesty's Ambassador at the Court of Athens, came in due time to confirm me in the conviction of the identity of my Second Mammalian Fauna of the Vienna basin (Inzersdorf, Belvedere) with those of Pikermi, Eppelsheim, and Mr. Lartet's "Miocène supérieur" (Cucuron, Vauluse).†

Other remains of Mammalia, preserved either in public or in private collections, have convinced me that our Vienna marine deposits, including remains of *Mastodon angustidens*, *Mast. tapiroides*, *Anchitherium Aurelianense*, and *Listriodon splendens*, answer exactly to M. Lartet's "Miocène moyen," an horizon to which, as proved by the specimens in the collection of the Joanneum at Gratz, the coal-bearing tertiaries of Parschlug, Eibiswald, Wies, and Aflotz (Styria) must likewise be referred.

The coal of Zemlye, near Totis (Hungary), including remains of *Anthracotheium magnum*, together with the deposits of Zouercado (Venetia), Cadibona (Piemont), and Rochette (Canton de Vaud), represents another and lower horizon, answering M. Lartet's "Miocène Inférieur," or the "Aquitanian strata" of the Helvetian Palæontologist, and the Fauna of which is anterior to the formation of the Vienna Basin in the strict sense of the term.

Before general results can be drawn from the comparison of terrestrial Mammalian Fauna, the species of some of the most important families must be duly determined and limited, to obtain (at least partially) a basis such as has been obtained from the marine Fauna by the distinguished researches of MM. Hörnes, Reuss, d'Orbigny, &c.

For obvious reasons Carnivora are constantly very inferior in individual number to their herbivorous contemporaries; and consequently their fossil remains are comparatively scarce. Even in our country the individuals of *Ursus spelæus*, buried in one single cave under diluvian deposits, may in some cases be numbered by hundreds, and the remains of badgers are said to be equally frequent

* Vienna Imperial Museum of Natural History, Antiquities, &c., as well as the Imperial Gallery of Pictures, is under the control of His Majesty's Lord Chamberlain's Office, from whose funds they receive their allowances.

† Bulletin de la Soc. Géol. de France, 1859, Vol. xvi. p. 476.

in the caves of N. Bohemia. One single cave near Theissholz (W. Hungary) afforded remains of bears, wolves, foxes, martins, and hyenas — *Imp. Geol. Institute, Jahrbuch, 1858, Verhandlungen, p. 147*); another cave in Hungary contains a remarkable quantity of *Felis spelæa*. The real cause of these great numbers is, however, that these caves were once the retreats of these animals, where for a number of subsequent generations their remains were accumulated. Carnivora are notably scarcer in the diluvial Loam (Löss) of the plains; and what I myself saw in such localities is little better than some few fragments.

Besides some loose teeth from the marine littoral deposits of Nussdorf, near Vienna (referable, as M. H. von Meyer remarked many years ago, to four different species, one of them probably insectivorous, but insufficient for accurate determination), and an anterior half of a lower jaw from a Mammal (probably referable to the family *Canidae*), out of the lignite of Eibiswald, kindly communicated to me by Professor Oichhorn, I know only three species of Tertiary Carnivora existing in Austria, and these are *Machairodus cultridens* (one individual), *Hyæna Hipparionum* (two individuals), and *Amphicyon intermedius* (one individual).

Machairodus cultridens.

The only remains of this large and powerful Carnivora known by me to have been found in Austria is an upper angular tooth from Baltavar, perfectly agreeing with the previously described specimens from Epplesheim and Pikermi. It may be, therefore, sufficient for me to notice a peculiarity left unmentioned by other descriptions. The ex-denticulated external edge is notably inclined towards the inner side of the tooth beneath the upper end of the crown, as indicated in Professor Owen's *British Foss. Mammalia*, p. 180, fig. 69, on the right. Isolated tubercles appearing first on the middle line of the opposed side, at last join upwards in forming a second denticulated edge; a slight trace of denticulation is likewise traceable near the middle line itself. The same particularities have been noticed by Professor A. Wagner in the teeth from Pikermi, preserved in the Museum of Munich. The localities of *Machairodus cultridens* hitherto known, are Eppelsheim, Pikermi, the Arno Valley, and Baltavar. The tooth found in this last-named place is in M. de Schwabenau's collection at Oedenburg (Hungary).

Hyæna Hipparionum, Gervais.

The remains of this species, the first representative of the genus *Hyæna* on our globe known to occur, have been discovered some in Austria, and two halves of lower jaws found at Baltavar; the one is in the Vienna Imperial Museum, the other in M. de Schwabenau's collection. Among the Pikermi fossils presented by Baron Breuner-

Felsach to the Imperial Museum is a left upper jaw, from a young individual just changing its teeth ; a remarkable specimen, as almost proving the identity of *Hycæna Hipparionum*, Gerv., with *H. eximia*, Roth. and Wagn., and admitting a more accurate comparison of this species with *Hycæna spelæa* and their living congeners.

The individual first described by M. Gervais (*Zool. Pal. Franç.*, p. 121, pl. xii, f. 1) differs from the Pikermi specimen only by being less in size ; another individual (*loc. cit.* pl. xxiv, f. 2-5), described by him as being "equal in size to *Hycæna spelæa*, and *H. crocuta*," leaves no doubt as to the specific identity between the individuals of Pikermi and Cucuron (Dept. de Vaucluse) ; affording at the same time an argument for the diffusion of this species over the whole of Middle Europe.

The tubercular tooth of *H. Hipparionum* surpasses in size those of any other living or extinct congener ; and the shape of the root suggesting the presence of an independent apophysis on the posterior portion (somewhat damaged in our specimen), the form of the fossil tooth stood next to the tubercular tooth of young individuals of the living *H. fusca*. There are still other analogies with the dentary system of young individuals of living species.

Amphicyon intermedius, H. v. Meyer.

The fresh-water limestone of Tucharitz (Bohemia), first described by Professor Reuss (*Vienna Imp. Academy Proc.*, 1860, vol. xlii, p. 56), contains a certain number of Mammalian remains, among which, besides those of *Rhinoceros* or *Acerotherium*, of *Chærotherium Sansaniense*, Lart. (*Sus Chærotherium*, Blainv.), and *Palæomeryx Scheuchzeri*, H. v. M., mixed with some few impressions of leaves (*Diospyrobrachysepala*, A. Br., and *Leguminosites Proserpinæ* [?], Heer), Professor Suess has recognised eighteen loose teeth, entire or fragmentary, belonging to one and the same individual of a large carnivorous mammal.

The laniary tooth of the left lower jaw, quite different from the analogous teeth in the genera *Felis*, *Hycæna*, and *Ursus*, belongs evidently to an animal of the family *Canidae*, evidently of more omnivorous habits than any other of this family, and larger in size than *Canis Neschersensis*, *Can. Issiodorensis*, or any other fossil species immediately referable to the genus *Amphicyon*, Blainv.

The laniary tooth of the upper left jaw, far inferior in size to the same tooth in the Wolf, and of a more omnivorous character, next resembling *Amphicyon minor*, Blainv. (Tab. xvi.)

The fragments of molar teeth, minute and incomplete as they are, prove the existence of at least three molar teeth (one more than in the genus *Canis*), of which the third or hindmost is provided only with one root. The incisive teeth resemble those of *Amphicyon* as figured by Blainville ; one of them shows conspicuously the compressed and flattened shape characteristic of this genus. From all

these circumstances, the following constitution of the dental system of the Carnivore whose remains are found in the fresh-water limestone of Tucharitz may be inferred. Incisors very much flattened, without superior apophysis, the outer upper ones canine-like; canines strong, moderately incurved, of oval transverse section, each with two strong vertical ridges; Pre-laniaries very high, number unknown; Laniaries, especially the upper ones, comparatively small, of evidently omnivorous character in both jaws; Upper Molars more than two, the last one rooted; of the Lower Molars the last or penultimate, with single root, is only known.

All these characters concur in denoting a genus of the *Canidæ* less carnivorous than the typical genus *Canis*, and even less so than any other form of the Tertiary genus *Amphicyon* as made known by Blainville. Notwithstanding certain analogies with *Otocyon*, the least carnivorous genus of living *Canidæ*, there is no reason for generically separating the form here in question from *Amphicyon*.

None of the species established either on Blainville's figures nor on generally rather incomplete remains found in Tertiary deposits being found to agree completely with the specimens from Tucharitz, I thought proper to consult M. H. v. Meyer, who had previously described some species of *Amphicyon* from the Tertiaries of S. Germany. This distinguished Palæontologist answered me kindly in the following words: "The species whose teeth you were pleased to send to me in figures, I think to belong to my *Amphicyon intermedius*. The transversal tooth answers a complete specimen which I know to have come from the freshwater limestone of Kirchberg, near Ulm; not quite complete specimens of upper and lower laniaries, and outer upper incisor from the Molasse of Ermingen and Heppbach, are only different from their somewhat larger size; they answer still better to incomplete teeth, in fragments of upper and lower jaws of *Amphicyon intermedius*, found in the brown coal of Köpfnach (Switzerland), and probably also in the Molasse of Günzburg."

Remains of *Amphicyon*, so far as is known at present, have exclusively been found in deposits ranking among M. Lartet's "Miocène moyen," and "Miocène supérieur," perhaps even only in the first of them. As far as I know, they have not yet been met with in the strictly so-called Vienna Basin.