tapers evenly to a subacute point, which has a very slight outward tendency.

The wing-membranes extend only to the distal extremity of the tibia, leaving the feet wholly disengaged. The latter are large, and have the toes longer than the remaining part of the foot.

On the interfemoral membrane may be observed about eight strongly marked transverse lines. The tip of the tail is free for the length of its terminal joint.

The wings are ample and broad, as the length of the fingers relatively to each other, and to the other dimensions, as given below, will testify.

The fur of the forehead approaches to near the end of the nose, but around the eyes the face is nearly naked, and the upper lip is destitute of a moustache. All the membranes are naked.

The fur is long, rather soft, and inclining to silky on the upper parts. On the whole of the upper surface of the body it is dark brown at the root, with its terminal half cinnamon-brown, brightest on the rump, and tinged with grey on the head and neck. Beneath it is dark at its base, with its terminal half brownish-white. Both above and beneath, the bicoloured character of the fur is conspicuous, and, as already mentioned, bears some resemblance in this respect to that of *V. ferrugineus*.

	"	'''
Length of the head and body, about	2	3
——— of the tail	1	9 or 10
——— of the head	0	10?
——— of the ears	0	7½
——— of the tragus	0	4
——— of the fore-arm	2	2 or 3
——— of the longest finger	3	10
——— of the fourth finger	3	0
——— of the thumb	0	5
——— of the tibia	0	11
——— of the foot and claws	0	6½
Expanse of wings	15	0

Hab. A single specimen in the British Museum Collection is labelled "India, Nassenabad, from Mr. Warwick, 1848," and, I believe, was collected by Capt. Boys.

GEOLOGICAL SOCIETY.

April 8, 1857.—Col. Portlock, R.E., President, in the Chair.

The following communication was read:—

"On the Species of Mastodon and Elephant occurring fossil in Great Britain.—Part I. Mastodon." By H. Falconer, M.D., F.R.S., F.G.S.

The object of this communication is to ascertain what are the species of the Proboscidea found fossil in Britain; what the specific names which ought to be applied to them; and what the principal formations and localities where they are elsewhere met with in Europe. The Mastodon of the Crag forms the subject of this first part of the memoir: the second part will treat of the Elephant-remains found in Britain. The author commenced by insisting on the importance to geology that every mammal found in the fossil state should be defined as regards, first, its specific distinctness; and, secondly, its range of existence geographically and in time, with as much severe exactitude as the available materials and the state of our knowledge will admit. He observed that with regard to the remains of the proboscidean genera, Dinotherium, Mastodon, and Elephant, some of which abound in the miocene and pliocene deposits of Europe, Asia, and America, the opinions respecting the species and their nomenclature, in all the standard palæontological works on the subject, are extremely unsettled and often contradictory.

Dr. Falconer then proceeded to explain his views of the natural classification of the proboscidean Pachydermata, recent and fossil, according to dental characters. In the Dinothere, with its tapiroid molars, the last milk-molar and the antepenultimate (or first) true molar are invariably characterized by a "ternary-ridged-crown-formula," or in other words, their crowns are divided into three transverse ridges. In the Mastodon not only the last milk-molar and the first true molar, but also the second or penultimate true molar (being three teeth in immediate contiguity), are invariably characterized in both jaws by an isomerous division of the crown into either three or four ridges; or, in other words, are severally characterized by either a "ternary-" or "quaternary-ridge-formula." These three isomerous-ridged teeth are referred to as "the intermediate molars." To the ternary-ridged species the author assigns the subgeneric name of *Trilophodon*; and *Tetralophodon*, to the quaternary-ridged species. The molar in front, and that one behind these intermediate molars are also characteristically modified in these two subgenera. In *Trilophodon* the penultimate or second milk-molar is two-ridged, and the last true molar is four-ridged: in *Tetralophodon* the former is three-ridged, and the latter five-ridged. The author considers it highly probable that a subgeneric group characterized by a quinary-ridge-formula (*Pentelophodon*) has existed in nature, but of which no remains have yet been discovered.

The Elephants are distinguished from the Mastodons by the absence of an isomerous-ridge-formula, as regards the three intermediate molars, and by the ridges ranging from six up to an indefinite number in these teeth, in different groups of species. Dr. Falconer arranges the numerous fossil and recent forms in three natural subgenera, founded on the ridge-formula, in conjunction with other characters. In the *Stegodon* (comprising besides other forms the *Mastodon elephantoides*, Clift) the ridge-formula is hypisomerous; and the ridges number six or eight. The *Loxodon* (including the African Elephant) is also hypisomerous, and has from seven to nine plates or ridges. The *Euelephas* (including the *Elephas indicus* and six fossil species) is the largest and most important group, and comprises the typical Elephants having thin-plated molars.

Here the ridge-formula is anisomerous, and regulated by progressive increments, as 8, 12, 16; the higher its numerical expression, the greater the liability to vary, within certain limits dependent upon the race, sex, and size of the individual; the lower molars often exhibiting an excess of plates over those in the upper molars.

Reverting to the Mastodons, Dr. Falconer observed that the subgenera *Trilophodon* and *Tetralophodon*, as regards number of forms, are of nearly equal value; the former comprising seven, and the latter six well-marked species. Each group is divisible into two parallel subordinate groups. In the one series the ridges are broad, transverse, more or less compressed into an edge; with the intermediate valleys open throughout and entirely uninterrupted by subordinate tubercles. These are represented in *Trilophodon* by *Triloph. ohioticus*, and in *Tetralophodon* by *Tetr. latidens*. In the other series the ridges are composed of blunt conical points, which are fewer in number, flanked in front and behind by one or more subordinate outlying tubercles, which disturb the transverse direction of the ridges and block up the valleys. This series is represented by *Trilophodon angustidens* and by *Tetralophodon arvernensis*. In both subgenera the species with transverse compressed ridges may be compared with *Dinotherium*, as regards their molar crowns; and the other series with *Hippopotamus*.

The European fossil species of *Mastodon*, according to the author, are the following :— *Trilophodon Borsoni*, I. Hays, *Tril. tapiroides*, Cuvier, *Tril. angustidens*, Cuvier (*pro parte*), *Tril. pyrenaicus*, Lartet MS., *Tetralophodon longirostris*, Kaup, and *Tetr. arvernensis*, Croizet and Jobert. With the exception of *Triloph. Borsoni* and *Tetral. arvernensis*, which are of Pliocene age, the above-named species are of Miocene age.

Dr. Falconer proceeded to state that the remains of only one species of Mastodon have hitherto been discovered in the British Isles. They occur in what is called the Older Pliocene Red Crag, at Felixstow and Sutton, in Suffolk, and in the Newer Pliocene Fluvio-marine or Mammaliferous Crag at various localities near Norwich and in Suffolk. After remarking that Professor Owen had referred the teeth of the Crag Mastodon to *M. angustidens*, making *M. longirostris* and *M. arvernensis* to be synonyms of this species (as Cuvier had also done), Dr. Falconer gave in detail the history of the discovery and publication of the true *M. angustidens* (Cuvier), and of the *M. arvernensis* and *M. longirostris*. He then passed in review the opinions and statements of these authors, as well as of Blainville, Laurillard, Gervais, Pomel, Lartet, and Sismonda, on these species, and on the specimens which these observers had severally described, sometimes under additional specific names. He then described the characteristic peculiarities both of the molars and of the symphysis of the lower jaws in these three species; and showed that the molars from the Crag Mastodon were, like those of *Tetral. arvernensis*, characterized by four-ridged molars, with their conical points more or less alternating, and with their valleys blocked up; and that they essentially differed from the molars of the *Triloph. angustidens* from Simorre, Dax, &c., and from the *Tetral. longirostris* of Eppelsheim. The *M. arvernensis* of Montpellier, Auvergne, Italy, &c. had no lower tusks; and the author is of opinion that the only specimen which has been figured and described as one of the lower tusks of the Crag Mastodon is a terminal fragment of one of the upper tusks of that species.

From osteological considerations it appears that *Tetral. arvernensis* was of a low and heavy make; that *Tetral. longirostris* was of similar general proportions; and that *Triloph. angustidens* was higher in its limbs and of a comparatively light and slender shape.

In his observations on the geological age and associated faunas of the formations in which these species severally occur, Dr. Falconer observed that *Trilophodon angustidens* is a characteristic species of the miocene Falunian beds throughout Europe, and is associated with *Triloph. tapiroides* in the Faluns of France and the upper freshwater Molasse of Switzerland. *Tetralophodon longirostris* is an important member of the Eppelsheim fauna, which, though its determination is accompanied with great difficulty, appears to be identical in its leading features with that of the Falunian deposits of France and Switzerland. The *Tetralophodon arvernensis* is characteristic of the pliocene fauna; and it had a very extended range of habitat over Europe, accompanying *Loxodon meridionalis* (Nesti) in Tuscany,—*Trilophodon Borsoni*, *Loxodon priscus*, and *Euelephas antiquus* in Piedmont and Lombardy,—*Loxodon meridionalis* at Montpellier,—and *Tril. Borsoni*, *Lox. meridionalis*, and *Lox. priscus*, in Velay and Auvergne. After having reviewed the circumstances under which Mastodon-remains occur in the British strata, Dr. Falconer concludes that,—1st. The Mastodon-remains which have been met with in the Fluvio-marine and Red Crags belong to a pliocene form, namely *Tetralophodon arvernensis*. 2ndly. The Mammalian fauna of the Red and Fluvio-marine Crags, regarded as a whole, bears all the characters of a Pliocene age, and is identical with the Subapennine Pliocene fauna of Italy. 3rdly. The Red and Fluvio-marine Crags, tested by their mammalian fauna, must be considered as beds of the same geological age.

Throughout this paper, for the sake of clearness, the subgeneric names have been used in designating the species. The author, finding that the name *Elasmodon*, applied to the third group of Elephants, in the 'Fauna Antiqua Sivalensis,' in 1847, had been previously used for a fossil fish, has abandoned it, and applies the term *Euelephas* in lieu of it.

April 22, 1857.—Colonel Portlock, R.E., President, in the Chair.

The following communications were read:—

1. "Description of a Crustacean from the Lias Bone-bed." By C. Gould, Esq., B.A. Communicated by J. W. Salter, Esq., F.G.S.

The specimen described was found in a coprolitic mass from the bone-bed of Aust Passage, by E. Higgins, Esq. It consists of a carapace and four abdominal segments. The former is smooth, subrectangular, with the eyes widely separated, and has three longitudinal ridges, and a cervical furrow extending right across the carapace. The latter are sculptured somewhat after the pattern of *Nephrops,* and are 2 lines in length altogether. Some small fragments of subtrigonal limbs accompany the carapace. After comparing the specimen with the known forms of Stomapoda and Macrura, the author concludes by stating that it appears to be a Decapodous Crustacean presenting certain points of resemblance to *Scyllarus* and *Nephrops,* but not assignable to any existing genus. Mr. Gould names it *Tropifer lævis.*

2. "Description of a Crustacean (*Pygocephalus Cooperi*) from the Coal-measures." By Prof. Huxley, F.G.S.

This new and remarkable Crustacean is represented by three specimens in ironstone nodules; each presenting, from the breakage of the nodules, the ventral surface in relief, with the corresponding impression. Two of the specimens are the property of R. S. Cooper, Esq., of Bilston, and were obtained from the shale overlying the upper or thick coal-beds of that place, associated with fragments of *Pecopteris.* The other specimen belongs to the Manchester Museum, and was derived from the coal-shales at Medlock Park Bridge. The animal is about $1\frac{1}{3}$ inch in length; its ventral surface presents at one extremity a quadrate disk, about $\frac{5}{8}$ inch long, furnished anteriorly with two pairs of jointed appendages (the large outer pair being antennæ; the inner smaller pair, the antennules), and margined by the narrow flattened edges of the carapace. The central portion of the body is about $\frac{1}{2}$ an inch in length, and is divided into a series of seven thoracic segments, composed of one medial and two lateral subquadrate plates, and increasing in size backwards by the gradual widening of the medial plates. Each segment is provided with a slender jointed limb on either side: the limbs are directed either forward or outward; and in one instance at least there is clear evidence of a fine, jointed filament, or exopodite, attached to a limb (the fifth). The posterior extremity of the specimen (constituted by the termination of the large abdomen, bent upon itself) is much wider than the other, and has the form of a semicircular disk; the base of the semicircle forming the widest part of the body, and being about half an inch distant from the centre of the curve. This semicircular, caudal plate is traversed by a linear depression at about the middle of its length; another transverse depression mark is near its periphery; and, on clearing away the matrix from the opposite surface of one of the specimens, this portion was found to be continued underneath with a greater convexity, and with indications of other transverse lines of depression, bounding dorsal segments. The surface of the caudal plate is also divided longitudinally by two depressions into three broad subtriangular lobes.

Prof. Huxley described in detail the process of his determination of the above-described characters from the successive examination of the several specimens; and intimated that at first, so problematical were the characters afforded by one or two specimens only, that the broader extremity was regarded as possibly the cephalic buckler of an anomalous Apus-like crustacean, with its dorsal surface presented to view. Subsequent examination of the specimens kindly lent by Mr. Cooper enabled the author to take a different and more probable view of the structural relations of these interesting fossils. Prof. Huxley pointed out that the *Pygocephalus Cooperi* has some peculiar relations with the little *Mysis* or Opossum-shrimp, especially in the schizopodous character of its thoracic appendages, in the proportional size of the carapace, and in the gradual increase in width, from before backwards, of the sterna of the thoracic somites. In the proportions of its abdomen, however, the *Pygocephalus* approximates more nearly to the true Stomapoda; and a *Gonodactylus* bent upon itself presents an appearance in some respects very analogous to that of the fossils in question.

MISCELLANEOUS.

On the Nervous System of Dentalium entalis. By M. T. de Lacaze Duthiers.

Three pairs of ganglia constitute the nervous system of animal life. One is placed in the cavity of the foot, another above the mouth, and the third a little in front and on each side of the anus.

The ganglia of the first pair, or *pedal ganglia*, are pyriform and approximated; they furnish the nerves of the foot and a single thread to the diaphragm which separates the visceral cavity from that of the foot.

The supra-œsophageal ganglia are well developed and approximated by their margins; each of them presents behind a secondary inflation, which cannot be regarded as another ganglion; from them arise important nerves, some of which, to the number of five, pass to all the anterior part of the tube of the mantle, others to the mouth, whilst the last, two in number, are distributed in the fold which serves as the base of the tentacular filaments surrounding the base of the buccal process.

The ganglia of the third pair are small, triangular, distant, and placed on each side a little in front of the orifice of the digestive tube. They only give origin to a long nerve, which after gliding between the elements of the liver, passes to the dorsal surface to run to the posterior extremity of the body, to the cavity through which the water serving for respiration enters. From their position and the nerves which originate from them, these ganglia appear to be exactly analogous to the branchial ganglia of the lamellibranchiate Acephalous Mollusca.

Connective nerves and commissures unite these little nervous centres amongst themselves. The cords which unite the pedal to the supra-œsophageal ganglia enclose the first portion of the digestive tube in a collar and are deeply seated; those which join the supra-œsophageal to the posterior ganglia are in the fold of union of the mantle

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