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LV.—*On the Dentition of the Common Mole (Talpa europæa).*
By C. SPENCE BATE, F.R.S. &c.*

[Plate XI.]

AMONG the families of the Mammalia none is found in which there is a greater variation in the dental arrangement than in that of the Talpidæ.

The number of the teeth is also larger than in any of the Mammalia except the Marsupials; they are only deficient by one on each side of each jaw of the full number of the Mammalian type.

The development of the teeth in the European species has been so little understood that the greatest diversity of opinions as to their homological distinction exists amongst zoologists. Thus we find, in Prof. Owen's 'Odontography,' four different formulas are given, being the result of as many different anatomists' observations, which may be expressed as follows:—

That of Fréd. Cuvier as

$$\text{In. } \frac{3}{4}, \text{ C. } \frac{1}{0}, \text{ P.M. } \frac{4}{4}, \text{ M. } \frac{3}{3} \times 2 = 44;$$

Bell as

$$\text{In. } \frac{3}{4}, \text{ C. } \frac{1}{1}, \text{ M. } \frac{7}{6} \times 2 = 44;$$

De Blainville as

$$\text{In. } \frac{4}{4}, \text{ C. } \frac{1}{1}, \text{ P.M. } \frac{3}{3}, \text{ M. } \frac{3}{3} \times 2 = 44;$$

Owen as

$$\text{In. } \frac{3}{3}, \text{ C. } \frac{1}{1}, \text{ P.M. } \frac{4}{4}, \text{ M. } \frac{3}{3} \times 2 = 44;$$

whilst Prof. Blasius gives, in his 'Fauna der Wirbelthiere Deutschl.,' that which may be expressed by

$$\text{In. } \frac{3}{4}, \text{ C. } \frac{1}{1}, \text{ P.M. } \frac{3}{2}, \text{ M. } \frac{4}{4} \times 2 = 44.$$

* Abstract of a paper read at the Odontological Society of Great Britain, April 1, 1867. Communicated by the Author.

Thus we have five formulas, expressive of as many separate opinions. It was therefore with satisfaction that the author obtained several specimens of young moles, as by their dissection he has been enabled to clear up the several points of difficulty, and establish the homological relations of each individual tooth beyond dispute.

Having made out and determined the forms and positions of the several teeth, and the relation that they bear, in the adult animal, to each other, the author proceeded to unravel the problem of their homological relation to the teeth in the Mammalian order.

In the placental mammals the largest number of teeth is forty-eight, consisting of three molars, four premolars, one canine, and four incisors, on each side of each jaw. In the European mole we find all present excepting one on each side of each jaw. The great point, therefore, to be determined is, which of the teeth of the permanent series is absent. M. Fréd. Cuvier has pronounced it to be an incisor from the upper jaw and the canine from the lower. Prof. Bell leaves out an incisor from the upper jaw and a molar from the lower; or, since he classifies the premolars and molars under that of molars, we may say that he omits a premolar from the lower jaw. Prof. De Blainville leaves out a premolar from the series in each jaw. Prof. Owen omits an incisor from each jaw; and Prof. Blasius, the most recent comparative anatomist who has written on the subject, leaves out an incisor from the upper, and a premolar from the lower jaw; but this last zoologist differs from all the previous writers in classifying the last premolar in each jaw as belonging to the series of molars. In this arrangement Prof. Blasius has evidently been governed by the form and size of the tooth rather than by its relative connexion with the deciduous teeth or their position in the jaws. Classification based upon such observation is liable to great variation, dependent upon the existing wants of animals, and therefore must possess a shifting character—a condition that must exclude it from scientific consideration. The only true classification of the teeth must be based upon their position in the jaws, and the homological relation that they hold to each other and to the teeth of other animals.

Thus there are only three molar teeth in the placental mammals, because there are but three teeth in the range of each jaw that are developed without having been preceded in their position by deciduous or milk-teeth. Therefore, since the tooth that Prof. Blasius classifies as the most anterior of the molar series is anticipated by a deciduous tooth, it must belong to the premolar, and not the molar series.

The author believes that if this test were applied to the Cape mole (*Chrysochloris aurea*), the teeth that Prof. Owen has pronounced to be molars would be found to belong (some of them) to the premolar series, and the huge biting-teeth in the anterior part of the jaw to the incisor or premaxillary teeth.

At the period when the young mole is about four inches long the deciduous teeth are so far developed that most of them are cutting their way through the gums, and all of them in a forward state. The two premaxillary bones are separated by a distinct suture from the maxillary, and by an extensive fissure from the palatal plates, which they approach only in the median line, by long projecting bony processes, and at the alveolar walls. In these bones are planted the eight anterior (four in each bone) of the deciduous teeth; these consist of slightly curved cylindrical tubes differing somewhat in the form of their crowns, that of the posterior being pointed and larger than the others. This tooth is implanted within the limits of the premaxillary bone, the suture separating it from the maxillary passing through the posterior portion of its alveolus, in which, in progress of development, is the large pointed crown of the first permanent double-fanged tooth, which we can now positively assert to be the homologue of the true canine, the peculiar implantation of which must therefore be described as a variation from the normal type to meet the requirements of a large and powerful tooth implanted in a jaw insufficiently deep to receive a corresponding fang.

The next series of deciduous teeth are situated in the maxillary bones; these represent the deciduous premolars (commonly called deciduous molars, and are succeeded by the permanent premolars.

In the lower jaw the canine tooth of the deciduous set may be determined by its position and form viewed in relation to that of the upper jaw; but all the deciduous teeth of the lower jaw are small and single-fanged, though the last or fourth deciduous premolar has a tendency to develop itself into two fangs at the extremity.

The entire series of the deciduous set may therefore be expressed by the following formula—as

$$\text{Decid. Premax. or Incisor } \frac{3}{3}, d. C. \frac{1}{1}, d. P.M. \frac{4}{4} \times 2 = 32;$$

and that of the permanent set as

$$\text{Premax. or Inc. } \frac{3}{3}, C. \frac{1}{1}, P.M. \frac{4}{4}, M. \frac{3}{3} \times 2 = 44.$$

Thus by actual observation the author has been enabled to

support the correctness of Prof. Owen's inductive analysis of the teeth of the mole, and demonstrate the homological relation of the several teeth.

At the period of examination no fur was developed upon the young mole's skin. The deciduous teeth had not yet pierced the gum, whilst the small extent of fang yet to be produced at the extremity shows how nearly the period had arrived for their protrusion through the gums; yet we cannot but be struck with the feeble connexion existing between the teeth and the alveolar walls, which rather appear to be undergoing absorption and waste for the purpose of the reception of the permanent set, than to be strengthening to support the milk-teeth in any efficient action. These circumstances, together with the forward stage of the development of the permanent set, suggest the idea that the deciduous teeth are developed according to a law of growth, but are not required to fulfil any want in the economy of the young animal's life; for they can scarcely be developed in their places before the period of the eruption of the permanent teeth; and this is probably coeval with the time when the fur is placed upon the young creature's back, and it is able to excavate the soil for itself.

Large spaces separate the deciduous teeth from each other, which, together with the feeble attachment that they have to the jaw, shows them to be useless as organs of mastication: this is most distinctly exhibited in the character of the deciduous premolars when compared with that of their permanent successors.

It is the most usual condition in the Mammalia above the Cetaceans and Bruta for the deciduous teeth that anticipate the premolars to be developed upon a more complex type, assuming more nearly the shape of the true molars than do those of the permanent set; but the author believes that this is but a rule subservient to a universal law—that whenever teeth are developed according to a law of growth, and not required for any functional purpose, they have a tendency to return to the primitive form of the Mammalian type; and such he takes to be the character of the deciduous teeth of the genus *Talpa*.

The author also described the microscopic structure of the teeth, and exhibited numerous drawings of the minute anatomy both of the teeth and jaws of the animal.

EXPLANATION OF PLATE XI.

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| <i>Fig.</i> 1. Upper jaw; adult. | <i>Fig.</i> 3. Lower jaw; adult. |
| <i>Fig.</i> 2. Ditto; immature. | <i>Fig.</i> 4. Ditto; immature. |
| 1, 2, 3 Inc., incisor or premaxillary teeth. | |
| 1, 2, 3 d. Inc., deciduous incisor or premaxillary teeth. | |

C., canines.

d. C., deciduous canines.

1, 2, 3 P.M., premolars.

1, 2, 3 d. P.M., deciduous premolars (commonly called deciduous molars).

1, 2, 3 M., molars.

LVI.—*Descriptions of some Indian and Burmese Species of Assimineæ.* By WILLIAM T. BLANFORD, A.R.S.M., F.G.S.

IN Dr. E. von Martens's "Conchological Gleanings," published in the March Number of the 'Annals' for 1866 (ser. 3. vol. xvii. p. 202), the first portion of the paper consists of observations "on some species of *Assimineæ*." Two new species from China and Singapore are described, and a list is added of the forms belonging to this genus known to the author. Amongst these the only species mentioned as occurring in India or Burma is the well-known *A. Francisci*, Gray*, from the estuary of the Ganges. The object of the present notice is to call attention to some species of the genus inhabiting Bombay and described some years since by Dr. Leith, and to describe two other species—one from Bombay, collected by the Rev. Mr. Fairbank, and another obtained by myself, in 1862, from the estuary of the Irawaddy in Burma.

Three species from Bombay were described by Dr. Leith as a new generic form, under the name *Optediceros*, in the 'Journal of the Bombay Branch of the Royal Asiatic Society' †, vol. v. p. 145. The paper, I learn from Dr. Leith, was presented to the Society in 1853, and published in July of that year, although the completed volume of the Society's Journal bears the date 1857. It is entitled "Note on an apparently New Genus of Gasteropod, by A. H. Leith, Esq., M.D." The genus is described as "a minute mollusk inhabiting the shores of Bombay Island, by the edges of salt-water pools, moving on the moist earth or rocks, and taking shelter under stones," and is distinguished by the following characters:—

* Called *A. Francesia*, Benson, by H. & A. Adams in the 'Gen. Rec. Moll.,' *A. Francesiæ*, Gray, by Benson in the 'Journal of the Asiatic Society of Bengal,' and *A. Francesi*, Gray, by Troschel (Geb. d. Schneck.). I cannot procure the work containing the original description in Calcutta.

† That Dr. von Martens was unacquainted with this paper is evident (indeed it appears to have entirely escaped the observation of conchologists), the description of the animal and operculum being excellent and amply sufficient to prove its identity with *Assimineæ*. It is greatly to be regretted that this paper is, so far as I am aware, the only published contribution to malacological science by one of the most careful observers in India. That the paper should have been overlooked is not surprising, as the Bombay Journal, though rich in archæological and geological papers, contains but few zoological contributions.



Bate, C. Spence. 1867. "IV.—On the dentition of the common mole (*Talpa europæa*)." *The Annals and magazine of natural history; zoology, botany, and geology* 19, 377–381.

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