

ON SOME POINTS IN THE STRUCTURE OF THE SKULL OF FOSSIL MUSK-DEER (*Cainotherium*).

BY CHARLES CARTER BLAKE, ESQ.

While examining lately the magnificent collection of fossil musk-deer, from Auvergne, in the collection of the British Museum, in the case devoted to the specimens collected by M. Bravard from the lacustrine calcareous marls of Puy-de-Dôme, a singular anomaly in the structure of the crania of the genus *Cainotherium* met my view. All the writers who have described the osteology of the skull of Ruminants have noticed those singular deficiencies or *lacunæ* which exist at the points of junction of the various bones, and which have been variously described as "lacrymal openings"* or "facial interspaces."† Their function has been unknown, and their presence, although constant in each individual species, is variable in species nearly allied to each other. In the *Cainotherium commune*, Bravard (*Microtherium Renggeri*), nearest allied to the *Hyomoschus* of the present day, ossification at this lacrymal point of intersection has extended to a much less degree than in its living analogue. The interspace in *Cainotherium* is longer in proportion to its breadth than the existing musk-deer (*Moschus chrysogaster*). In the *Dorcatherium Navi*, Kaup., on the contrary, not the slightest interspace is exhibited, and the lacrymal angle is definitively closed: In some of the specimens named *Cainotherium* in the British Museum, no interspace exists. These probably belong to a separate species,‡ as De Blainville remarks on the typical *Cainotherium commune*, termed by him *Anoplotherium laticurvatum*, that it possesses "*des lacunes sous-lacrymales assez grandes, en forme de longues virgules.*"

It is most interesting to observe a similar anomalous diversity of structure exists in the recent species of ruminants most nearly allied to the Moschidæ and Microtheria.

I need only call attention to the fact that a large lacrymal opening is present in the Llama (*Auchenia Llama*), and none in the Vicuña (*A. Vicuna*); that in the yellow-bellied musk (*Moschus chrysogaster*) a large, and in the small water-musk of Western Africa (*Hyomoschus aquaticus*) a small interspace exists; whilst in the nearly allied *Meminna Indica*, *Tragulus Stanleyanus*, and *T. pygmaeus*, ossification has extended over the whole point of junction of the lacrymal (73), frontal (11), nasal (15), maxillary (21), and premaxillary (22) bones.

The object of my present communication is to point out some of the reasons for this singular anomalous structure in the fossil and recent Moschidæ.

* Gray, 'Catalogue of Mammalia' in collection of British Museum, part 3.

† Spencer Cobbold, "Ruminantia," in Todd's, 'Cyclopædia of Anatomy and Physiology,' p. 513.

‡ De Blainville, "Ostéographie," *Anoplotherium*, p. 75.

The functional interpretation of this singular diversity of organization in animals otherwise so nearly allied to each other, may not be manifestly apparent to the philosophical zoologist. It was satisfactorily ascertained in the year 1836* by the observations of Messrs. Bennett, Owen, Ogilby, and Hodgson, that the suborbital sinus subserved a purpose connected with the generative functions, being dilated and swollen at certain periods of the year. But the connection of the development of the glandular structure of the carneous lacrymal sinus with the degree of ossification to which the cheek-bones extend is not obvious. If however we suppose that the large periodical swelling which, according to Mr. Hodgson, forms a huge lump of flesh bigger than, and like in shape to, the yolk of an egg, increases periodically in its dimensions, its backward pressure towards the cheek-bone would be seriously impeded by a bony wall, such as we find in the *Tragulus pygmaeus* or the *Auchenia Vicuna*. The aponeurotic fascia which fills the lacrymal interspace in the *Hyemoschus aquaticus*, or the *Auchenia Huanaca*, would, however, yield more easily, and thus those species would in certain seasons have a greater development of their suborbital sinuses.

Mr. Ogilby† laid down the theory "as a general remark, which however he stated was not universal, that in intertropical animals the lacrymal sinus is larger than in more northern species, and in those whose range is limited to mountainous districts." This incomplete induction may be considered partially corroborated by the osteology of the Llamas. In the three varieties, Guanaco, Llama, and Alpaca, a more or less large "sublacrymal lacuna" is left. In the Vicuña, ossification has extended to such a degree as to close this completely up. How does this singular fact bear upon the theory that there is a relation between the gregarious habits of those antelopes and musk-deer which frequent the plains, and the presence of the lacrymal sinuses, and consequent non-ossification of the cheek-bones? The species of *Auchenia* which has no lacuna, is confined to the most elevated table-lands of Bolivia and Northern Chile. The three varieties in which large lacunæ are exhibited, are found over the whole Andian range, the Guanaco supporting life alike under the tropical sky of New Granada, or the frozen steppes of Patagonia. In this species we find a large development of the lacrymal interspace. But both the Guanaco and Vicuña are gregarious. It is therefore quite clear that the development of the lacrymal sinus, or the degree to which the lacrymal and other cheek-bones are ossified, have no reference whatever to the gregarious or solitary habits of the species. This was sufficiently proved by the table which was submitted by Professor Owen to the Zoological Society (Proceedings, 1836, p. 36), in which it was conclusively shown that no constancy or correlation existed with respect to the presence or absence of the suborbital sinuses. And the facial interspace seems an equally in-

* Proc. Zool. Soc. 1836, p. 34.

† Proc. Zool. Soc. 1836, p. 38.

constant character in the antelopes, as differentiating various sub-genera or natural groups.

If any philosophical thinker can explain what is the *vera causa* which has provided for the Cainotherium and Guanaco deep pre-orbital interspaces, whilst in their congeners the Dorcatherium and Vicuña, no such interspace exists, a character originally pointed out by Dr. J. E. Gray, and which according to my experience is the sole specific difference which can be demonstrated, such explanation will be of great benefit to zoological science. The above observations are made solely with a view of suggesting further inquiry on this most interesting topic. I trust that some of those writers who have so carefully studied the osteology of Ruminantia, may be led to reconsider the question, and to make further observations on the function of the facial interspaces in both recent and fossil ruminants.

It has been suggested to me, that the two holes in the *Microtherium* skull, as they are undoubtedly asymmetrical, might have been produced artificially or accidentally, the bone at this place being exceedingly thin. Should such a theory be proved correct, the *Microtherium* of the Auvergne deposit would still find its nearest analogue in the existing Meminna of Ceylon, and by the demonstration of this affinity, still further corroborate the truth of Professor Owen's generalization,—“The affinity of the Microtheres to the Cheorotains is nevertheless very close” (Palæontology, 2nd ed. p. 372).

ON THE DISCOVERY OF HUMAN AND ANIMAL BONES IN HEATHERY BURN CAVE, NEAR STANHOPE.

BY JOHN ELLIOTT, ESQ.

In a tolerably deep ravine, surrounded by trees and brushwood growing in wild profusion, was, until lately, a cave, in that member of the carboniferous formation locally called the “Great Limestone,” and situated about one mile and a quarter north from the town of Stanhope, in the county of Durham. The limestone is now being worked for the purpose of supplying the Weardale Iron Company with a flux used in the operation of smelting their ironstone; and consequently the cave has been laid bare to the light of day.

The cave was much visited a few years ago, both by strangers and persons living in the locality, but probably few of the visitors ever studied the excavating forces by means of which the cave was hollowed out of the solid limestone, and fewer still, if any, would think that they were treading on a primeval burial-place.

Doubtless the excavation must be mainly due to aqueous agency, but a reference to Sir Charles Lyell's ‘Principles of Geology,’ Professor Phillips's ‘Treatise on Geology,’ and Richardson's ‘Geology,’ shows that our leading writers on this subject consider that the *first*