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ORIGINAL ARTICLES.

I.—On some Bird Remains from the Upper Cretaceous of Transsylvania.[1]

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So long ago as 1897 Baron Franz Nopcsa[2] recorded the discovery of numerous bones of Dinosaurs and Chelonians in freshwater deposits of Upper Cretaceous age at Szentpeterfalva in Transsylvania. Since that time he has made extensive collections of bones from the same locality and has published various papers concerning them. In his last collection, now in the British Museum (Natural History), there occur some fragments of limb-bones which he does not consider to be reptilian but rather of avian origin. These specimens he has kindly submitted to me for determination and description, and they form the subject of the present paper.

The limb-bones of which portions have been obtained are the femur and tibio-tarsus. The femur is represented by two imperfect specimens: of these, one consists of the upper end and about the proximal fourth of the shaft (Fig. 1), almost uncrushed and altogether in a very good state of preservation; the other includes the upper end and the greater part of the shaft, but in this case the bone has been much crushed and broken and the head and other prominences considerably abraded.

The head of the femur (*h.*) is large and would be nearly hemispherical if it were not for the large circular fossa for the attachment of the *ligamentum teres* (*l.t.*), situated rather towards the posterior side of the head and looking inwards and backwards. Ventrally the head is marked off by a well-defined groove, but above its surface passes into that of the great trochanter (*tr.*), the two being separated by a slight concavity only. The head as a whole is directed slightly upwards, rising a little above the trochanteric surface. This latter is gently convex and roughly triangular in outline, its most prominent angle projecting strongly forwards and inwards. The posterior angle is less prominent and is truncated by a deep muscle impression (*o.m.*), probably for the attachment of the obturator muscles. Beneath the trochanteric surface the anterior face of the bone is concave, the concavity being bounded above by the rather prominent anterior edge of the trochanter, and externally by a strongly developed forwardly directed ridge running down from the antero-external angle. The lower end of this ridge is continued

[1] Published by permission of the Trustees of the British Museum.
[2] Verhandl. d. k. k. geol. Reichsanstalt (Vienna, 1897), p. 273.

on to the anterior face of the shaft as a strongly marked *linea aspera*, which runs downwards and obliquely across towards the inner distal condyle; its full extent cannot be seen on account of the incompleteness of the distal end of the specimen. This ridge probably marks the line of insertion of the femoro-tibial muscles. The outer face of the trochanter is concave, owing to the presence of deep pits for the insertion of muscles, probably the *gluteus medius* and the *gluteus externus*. The surface truncating the posterior angle of the trochanter and probably serving for the attachment of the obturator muscles has already been referred to.

Beneath the trochanteric region the bone narrows to a shaft which is oval in section, the transverse diameter being a little the greater. The muscular ridge on the anterior face has already been referred to, and there is another strong *linea aspera* (*l.a.*) on the hinder face, beginning just beneath the trochanter and running downwards and outwards, apparently towards the outer condyle, and becoming very strongly marked at its lower end. There is some evidence that towards its lower end the shaft curved considerably backwards.

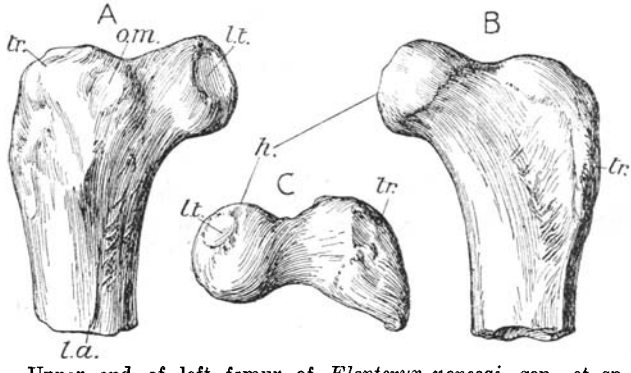

FIG. 1. Upper end of left femur of *Elopteryx nopcsai*, gen. et sp. nov. A, from behind; B, from the front; C, from above. Type-specimen, ⅔ nat. size. *h.* head of femur; *l.a. linea aspera*; *l.t.* pit for the insertion of the *ligamentum teres*; *o.m.* point of insertion of the obturator muscles; *tr.* trochanter.

In the uncrushed specimen the fractured end shows that the wall of the shaft consists of a hard compact outer layer measuring from 3·5 mm. in thickness at the front and back to about 6·5 mm. at the sides. Within this there is a spongy layer of indefinite thickness enclosing a central cavity. Judging so far as is possible from the crushed specimen, the central cavity is larger towards the lower end of the shaft, the spongy layer being less developed, while the outer hard layer also is thinner. The outer surface of the bone is sculptured in a remarkable way, being raised into a series of fine wrinkles which are for the most part irregular and run into one another, though in some places, as for instance on parts of the anterior face of the trochanter, they may be more or less parallel, and in that case, as a rule, they run more or less in the direction of the long axis of the

bone. A similar sculpture may be seen on some bird-bones, e.g. on the femur of *Phalacrocorax* and to a less extent in *Pelecanus*, but in these cases it is less distinctly seen, being partly masked by the presence of organic matter which has been removed in the fossils. Similar sculpture occurs on the fragment of a tibio-tarsus described below. This peculiarity in the texture of the surface of the bone, taken together with the similarity of form of these femora with those of some recent birds, even in details of muscle attachment and of the disposition of the *lineæ asperæ*, seems to leave no doubt as to the avian nature of these remains.

A fairly exhaustive comparison of these portions of femora with those of various groups of recent birds leads to the conclusion that, so far as the evidence available goes, there is reason to believe that these extinct forms approach most nearly to the Steganopodes, e.g. the cormorant (*Phalacrocorax*). The points of similarity are (1) the form of the great trochanter, especially the strong forward prominence of its antero-external angle, (2) the position and depth of the muscle impressions on the outer face of the trochanter, (3) the fact that the summit of the head rises above the trochanter, (4) the large

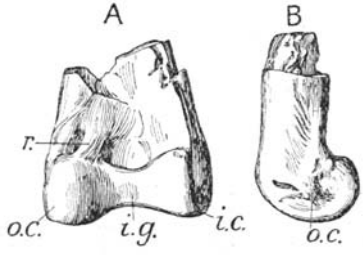

FIG. 2. Distal end of the right tibio-tarsus of (?) *Elopteryx nopcsai*. A, from front; B, from outer side. ⅔ nat. size. *i.c.* inner condyle; *i.g.* intercondylar groove; *o.c.* outer condyle; *r.* outer ridge.

size of the pit for the *ligamentum teres*. Furthermore, the arrangement of the muscular ridges, at least in the upper part of the shaft, is closely similar to that seen in the Steganopodous femur, as is also the tendency to a backward flexure of the lower part of the bone. The bird represented by the remains just described was about as large as a pelican and is certainly different from any previously known form. I propose that it should be called *Elopteryx nopcsai*, gen. et sp. nov.

Another specimen which seems to belong to a bird is the distal end of a right tibio-tarsus (Fig. 2), including the articular region and about two centimetres of the lower end of the shaft; both the articular end and the shaft are strongly compressed from before backwards. The articular surface consists of two sub-equal condyles, the outer (*o.c.*) being a little the more prominent and convex; these are separated by a deep intercondylar groove (*i.g.*), bounded above by a narrow shelf of bone which forms the floor of a deep fossa at the lower end of the anterior face of the shaft. The condyles project very little posteriorly, and pass by a continuous curve into the flat or

very slightly concave posterior face of the shaft; the trochlear surface of the inner condyle (*i.c.*) extends a little higher up than that of the outer. The fossa on the anterior face of the shaft is bounded internally by a slight ridge, while on its outer side there is a strong flattened ridge (*r.*) running obliquely down to the upper border of the outer condyle, and perforated by a very narrow passage directed obliquely downwards and inwards. This passage is too narrow to represent the channel for the extensor tendons, present in most birds, and moreover is not in the right position. A similar foramen is present in many birds of very different groups, e.g. *Didus* and *Dinornis*; probably it transmitted a blood-vessel. The outer face of the external condyle bears a deep rounded fossa towards its anterior border, and behind this there is a narrow deeply cut pit, both probably serving for the attachment of strong ligaments. The inner face of the inner condyle is also excavated for the attachment of ligament, but the cavity is comparatively large and shallow. Above the inner condyle on the side of the shaft there is a roughened depression for the attachment of a muscle. No very closely similar form of tibio-tarsus has been found among recent birds. The fact that the condyles are nearly equal in size and that one does not project below the other separates this tibia widely from that of *Phalocrocorax*, and gives the impression that the bird was not adapted for swimming, but was ambulatory. It is of course uncertain whether this tibia belongs to the same bird as the femora described above, but from the close similarity of the sculpturing of the surface of the bone in the two cases it seems most probable that this is the case. If that is so, the resemblances found to exist between the femur of *Elopteryx* and that of *Phalocrocorax* lose some of their value, and it appears possible that the deep muscle impressions on the trochanter of the femur, though indicating a very powerful limb, do not necessarily point to an aquatic mode of life. Much more material must be obtained before it is possible to ascertain the affinities of *Elopteryx*, but that a large bird existed in Transsylvania at the close of the Secondary period and in association with *Mochlodon*, *Telmatosaurus*, and other Dinosaurs is certain. It is not the occurrence of birds at this horizon that is remarkable, but the extreme rarity of their remains, while their complete absence from such deposits as the Purbeck and Wealden is still more extraordinary. The few remains that have been found in the later Secondary rocks show that the group was already highly differentiated, and in the Eocene probably all the chief orders now existing were already established.

II.—Notes on new or imperfectly known Chalk Polyzoa.

By R. M. Brydone, F.G.S.

(*Continued from the March Number, p. 99.*)

(PLATE VII.)

THERE are a number of simple Cheilostomata which develop avicularia distinctly larger than the zoœcia and more or less constricted in the middle by prominent masses apparently due to