

Looking at the skeleton, as here shown, it is evident that the most striking features are the large and peculiar skull, and the elongate and slender limbs and feet—characters that do not in themselves suggest the suilline affinities of the animal, which a closer study brings to light. The most notable points in the skull, as here indicated, are the long, pendent process of the malar bone, characteristic of some of the sloths, and the strong projections on the lower jaw. The latter supplement the malar process, but are developed to a greater degree than in any other mammals. Another feature of the skull to which the writer has already called attention is the very small brain-case, which proves that the brain itself was very diminutive. This was also true of the other known species, and was probably the main reason which led to the early extinction of the whole group.

The slender, highly specialized limbs and feet are likewise particularly noticeable in the restoration. They indicate clearly that the animal was capable of considerable speed, and this must have been of great service as a protection from its enemies. It will be seen that in each foot there are only two functional digits, corresponding to the third and fourth in man. The first digit is entirely wanting, and only remnants remain of the second and fifth.

Such reduction was, of course, a gradual process, extending over long geological periods. It indicates clearly a change of environment from the swampy home of the primitive five-toed suilline to the elevated, firm upland of later times, over which the present species and its near allies doubtless roamed. A parallel instance, still more striking, is seen in the gradual change which took place in the equine mammals, as first shown by the writer more than twenty years ago.¹

The *Elotheridæ* were evidently true suillines, but formed a collateral branch that became extinct in the Miocene. They doubtless branched off in early Eocene time from the main line, which still survives in the existing swine of the old and new worlds.

III.—ON *TEMNOCHEILUS CORONATUS*, M'COY, FROM THE CARBONIFEROUS LIMESTONE OF STEBDEN HILL, NEAR CRACOE, YORKSHIRE.

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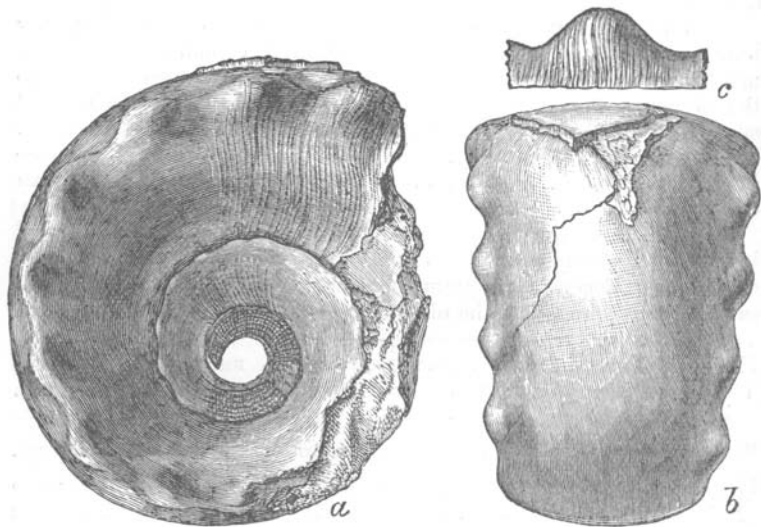
THE specimens which form the subject of this paper were obtained by Mr. E. J. Garwood from the Carboniferous Limestone of Stebden Hill, near Cracoe, Yorkshire; and the writers are indebted to the kindness of Mr. Garwood for permission to describe them. Respecting the horizon and locality from which the species came, Mr. Garwood says, in a letter to one of the writers: "Stebden is a hill which Tiddeman [of the Geological Survey] describes as one of his knoll reefs, and is, in my opinion, the equivalent of the Upper Scar limestone on the south side of the Cracoe fault, where it is much more fossiliferous than on the north

¹ American Journal of Science, vol. vii. p. 257, March, 1874.

(i.e. Pen-y-gent, Ingleboro, etc.).” Mr. Garwood adds: “Both of the specimens were much larger, when first exposed in the matrix; but the rock was so jointed, and the outer whorl [body-chamber?] so hollow, and replaced by calcite crystals, that only fragments of this could be obtained, and a good deal was broken before I could discover the extent of the fossil *in situ*.”

The close resemblance of the present form to the *Temnocheilus coronatus* of M'Coy will be apparent to any one acquainted with that species, either through the figure given of it in the “Synopsis of the Carboniferous Fossils of Ireland” (pl. iv. fig. 15), or by direct knowledge of the specimen itself in the Museum of Science and Art, Dublin. M'Coy's specimen, which came from the Carboniferous Limestone of Little Island, near Cork, is, however, greatly distorted by cleavage, and is apparently immature.

In his “British Palæozoic Fossils” (p. 557), M'Coy referred to this species some examples from the Carboniferous Limestone of Lowick, Northumberland, and these enabled him to amend his original description of the species. These specimens are now preserved in the Woodwardian Museum, Cambridge; one is fairly complete and four are fragmentary. They are all internal casts and



Temnocheilus coronatus, M'Coy.—*a*, lateral view of inner whorls of an example about 130 mm. in diameter; *b*, peripheral view of the same; *c*, tubercle of another specimen at a diameter of about 120 mm., showing the coarse lines of growth. *a* and *b* are slightly reduced, *c* is of the natural size.

bear only fragments of the test; but upon the inner whorl of the tolerably complete example there is an indication of the longitudinal ornamentation of the test, and this is just as in M'Coy's type-specimen; moreover, the dimensions and other characters of these examples agree so closely with M'Coy's type, that we think there

cannot be any doubt as to their identity. But Mr. Garwood's specimens (there are two) are in such a fine state of preservation, and probably nearly, if not quite, mature, that they enable us to add somewhat even to M'Coy's amended description of the species. One specimen has a diameter of 125 mm.; the other, the inner whorls of which are represented in the accompanying figure (the outer being omitted to save space), was somewhat larger.

The shell consists of rather more than three whorls, and there is a central elliptical vacuity whose diameters are 10 and 7 mm. respectively. The septa are about 10 mm. apart on the periphery, where the shell has a diameter of 90 mm. The ornaments consist of a row of tubercles situated at the junction of the umbilical and peripheral borders. Beginning at about the mid-length of the first whorl as obscure undulations, the tubercles gradually increase with the growth of the shell, until at about the second whorl they have become large and prominent. They are of a flattened conoidal form and slightly elongated longitudinally. There are fourteen tubercles per whorl in an adult shell. The test is thin, its surface marked with fine striæ of growth, forming an obscurely sigmoid curve upon the sides, and bent backwards in a deep sinus on the periphery, where they become much coarser in the adult shell, especially in crossing the tubercles (see Figure). The ornamentation of the young shell is that which is characteristic of most, if not of all, of the coiled Nautiloids, including the recent *Nautilus*, viz. fine longitudinal raised lines, crossed by still finer ones, and thus forming a beautiful cancellated structure. The transverse lines become obsolete before the end of the first whorl, but the longitudinal lines die out at about the end of the first fourth of the second whorl, among the last to disappear being two lines just below the tubercles.

Some differences are observable between M'Coy's type and the Yorkshire form, the peripheral area in the former being a little wider than that of the latter, and the sides of the umbilicus rather steeper; the tubercles also are more flattened than they are in the English fossil. These differences, however, may be rightly attributed, we think, to the distortion undergone by M'Coy's specimen, the lateral pressure having widened the periphery, while at the same time altering the true form of the umbilical region. M'Coy's figure (pl. iv. fig. 15) represents a more perfect specimen than the one from which it was drawn, unless the latter has since been damaged. The only species with which M'Coy, when describing his species, compared it is the *Nautilus* [= *Cœlonautilus*] *cariniferus*¹ of J. de C. Sowerby, tuberculated species of the group now called *Temnocheilus* being probably rare at the time M'Coy wrote. But in his "British Palæozoic Fossils" (p. 558), M'Coy in referring to this species says: "This exceedingly rare species is distinguished completely from the *N. tuberculatus*² by the great thickness, or width, of the mouth as compared with the diameter, the much more rapidly

¹ J. de C. Sowerby, Min. Con. vol. v. p. 130, pl. cccclxxxii. fig. 3 (excl. fig. 4).

² J. Sowerby, Min. Con. vol. iii. p. 90, pl. cexlix. fig. 4.

enlarging whorls, much deeper and narrower umbilicus, direction of the flattening of the tubercles, acutely elliptical form of the transverse section of the whorls, and forward instead of backward wave of the edge of the septa at the middle of the periphery." We have examined J. Sowerby's type of *Nautilus tuberculatus*, which is in the British Museum (Nat. Hist.), and have no doubt that it is specifically distinct from M'Coy's species.

De Koninck,¹ in describing the present species from Visé, Belgium, compares it with *N. biangulatus*, J. de C. Sowerby [?= *Cælonautilus cariniferus*, J. de C. Sowerby], and with *Nautilus tuberculatus*, J. Sowerby, and *Nautilus latus*, Meek and Worthen. He distinguishes M'Coy's species from Sowerby's and Meek and Worthen's by its smaller size, the greater relative height of its aperture, the depth of its umbilicus, and the form of its septa. As far as can be judged by the figures there seems much to justify de Koninck's identification of the Visé fossil with *Temnocheilus coronatus*; and Mr. Garwood in a letter to one of the writers expresses the same view, he having seen the specimens in the Natural History Museum at Brussels last autumn.

There is a small but well-preserved specimen in the Woodwardian Museum, Cambridge, from the Carboniferous Limestone, Settle, Yorkshire, which we think belongs also to this species.

Finally, our best thanks are due to Mr. W. W. Watts, of the Geological Survey, through whom we obtained access to Mr. Garwood's specimens, and to Prof. Hughes and his assistants, Messrs. Woods and Reed, for their kindness in allowing one of us to examine M'Coy's types in the Woodwardian Museum, Cambridge.

IV.—JURASSIC AMMONITES: NOTES ON A PAMPHLET BY PROFESSOR GUIDO BONARELLI.²

By S. S. BUCKMAN, F.G.S.

ITALIAN geologists have made several valuable contributions to our knowledge of the Jurassic strata of their country. Unfortunately some of their works are not known here as they deserve to be, and seem difficult to obtain. At the same time I have to acknowledge with thanks the receipt of some valuable memoirs which have been of particular service; and one of the latest arrivals is the present pamphlet.

This memoir deals with what has usually been called "Upper Lias" and "Lower Inferior Oolite"; but these terms the author proposes to replace by "Toarcian" and "Aalenian." He deals, first, with the palæontology, and mentions various well-known species, some of which we are familiar with in this country, but others are peculiar to the districts adjacent to the Mediterranean. In this connection it may be noted that *Hammatoceras* in a great measure, and

¹ Faune du Calcaire Carbonifère de la Belgique (Annales du Mus. Roy. d'Hist. nat. de Belgique, vol. ii.), part i. 1878, p. 115, pl. xxiv. ff. 2a, b.

² Osservazioni sul Toarciano e l'Aaleniano dell' Apennino centrale. Boll. d. Soc. geol. italiana, vol. xii. fasc. 2, pp. 195–254. Rome, 1893.