

bulging up at the surface, is reduced by denudation to the form of a mountain-chain.

This theory has at different times received attention from geologists, and it has met with a considerable amount of adverse criticism. Much of that criticism appears to me of a very forcible character, but one of the strongest objections that can be brought against the theory does not seem to have been generally noticed.¹

It is obvious that the heat which passes into and expands the sediment must be withdrawn from the immediately adjoining parts of the earth's crust, partly laterally, but chiefly from below; and that the amount of heat gained by the sediment must be equal to that lost by the crust. The increase in volume of the sediment must therefore be accompanied by an equal decrease in volume of that part of the crust from which the heat has been derived. Thus, the sediment in expanding must follow a crust that is retreating, and this retreat must take place, partly laterally, but chiefly downwards. Instead, then, of the sediment bulging up at the surface, and ultimately forming a mountain-chain, its uppermost layer must remain practically stationary (so far as the effect of the transference of heat alone is concerned), while most, if not nearly all, of the sediment below must subside.

It may, in reply to this, be urged that the sediment will check for a time the natural outward flow of heat from the earth's interior, while the heat will continue to pass as before through the other parts of its surface which are not areas of sedimentation. This may be the case, but the amount of heat so checked cannot be great. Supposing no heat at all to escape for some time through the sediment, then its effect in raising the surface of the mass relatively to that of the earth, can at the very most be represented by the diminution of the earth's radius during that time; and this diminution will be small. The actual relative elevation of the surface of the sediment, if there be any, will of course be very much less than the change of radius.

It follows, then, that the expansion theory is a theory of subsidence, rather than a theory of elevation.

VI.—ON A MICROSAURIAN (*HYLONOMUS WILDI*, sp. nov.) FROM THE LANCASHIRE COAL-FIELD.

By ARTHUR SMITH WOODWARD, F.G.S., F.Z.S.

DURING a recent examination of a collection of fossils made by Mr. George Wild in the Burnley Coal-field, Mr. John Ward, F.G.S., recognized a novelty in the small Microsaurian which forms the subject of the following notes. The specimen was forwarded

¹ It has not, however, been overlooked by the Rev. O. Fisher. "The heat conducted into the new deposits," he remarks, "must be abstracted from the couches beneath, so that there can be no absolute increase in the amount of heat beneath the area in question except such as is supplied to it laterally, so that the process must be excessively slow" (Physics of the Earth's Crust, second edition, p. 132). I am indebted to my friend Mr. Fisher for drawing my attention to this paragraph, which, with the exception of the last few words, contains in a condensed form the argument that follows.

to the British Museum for determination, and a detailed study of its characters proves it to represent a Microsaurian family that has not previously occurred in the Carboniferous of Europe.

The fossil was obtained from the roof of the "Bullion Coal" at Trawden, near Colne, and comprises the head, abdominal region, and base of the tail of a small animal, occupying the whole of an elongated split nodule 0.08 m. in length. The jaw cannot have measured less than 0.017 in length, and the distance between the two pairs of limbs must have been about 0.036. There are also indications that the trunk was comparatively robust, and also somewhat laterally compressed.

Of the *head*, no recognizable portions remain beyond the mandibular rami. The ramus of the left side, imperfect at both extremities, is shown of twice the natural size from the inner aspect in Fig. 1, *md.*, and exhibits some of the conical teeth, which, though robust, have a very large pulp cavity with the walls apparently not folded even at the base. The axial skeleton of the trunk is also unsatisfactorily preserved, the remains of *vertebræ* merely indicating that they were well ossified and not permitting the determination of their characters. Portions of some of the anterior *ribs* (Fig. 1, *r*) prove their stoutness, with an expansion both proximally and distally; but whether they possessed a distinct head and tubercle cannot be determined. Traces of the posterior abdominal and caudal ribs suggest that these were comparatively slender.

The *interclavicle* (Fig. 1, *i. cl.*) is relatively large, and seems to have been rhomboidal in form, though the margins are not well

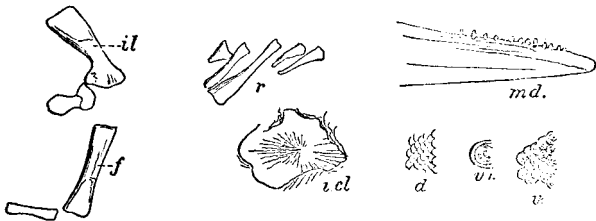


FIG. 1.—*Hylonomus Wildi*, sp. nov.: outlines of bones and dermal scutes.—Coal-measures, Trawden, near Colne. *d.* dorsal scutes; *f.* femur; *i. cl.* interclavicle; *il.* ilium; *md.* mandibular ramus; *r.* anterior ribs (only partially exposed); *v.*, *v.* ventral scutes. All the figures of twice the natural size, except *v.*, which is enlarged four times.

shown. It must have been at least as long as broad, and the exposed surface is distinctly ornamented with radiating rugæ and furrows. Of the pectoral limb there are only obscure indications. In the pelvic arch and limb, however, some of the bones are recognizable, notably the left ilium and femur. The *ilium* (Fig. 1, *il.*) is vertically elongated, with a short expansion below, a mesial constriction, and a gradual widening towards the truncated upper extremity. At its base, part of a thin laminar bone probably represents the ischium. The ilium is almost as long as the *femur* (Fig. 1, *f.*), which, though fractured and perhaps in side view, seems to be comparatively

slender, and must have been terminated at each extremity by unossified cartilage. The *tibia* (? or fibula) also appears to have been slender, equalling about one-half the length of the femur; but its outline is not satisfactorily shown.

The dermal *scutes* cover the whole of the trunk so far as preserved, all being oval in shape, deeply imbricating, and exhibiting prominent concentric lines of growth. Those of the ventral armour (Fig. 1, *v.*) are much larger than those of the dorsal (*d.*); and the former, when magnified (*v'l.*), show feeble radiating lines either superficial or structural.

The fossil thus described may be assigned without much doubt to the Microsaurian family of *Hylonomidæ* as restricted by Fritsch.¹ So far as known, indeed, it cannot be separated from the type genus *Hylonomus* itself. The general proportions are similar, and there are the same indications of the laterally compressed form of the trunk; while the relative stoutness of the anterior ribs will also doubtless be proved to characterize the typical species from Nova Scotia when sufficiently well preserved examples are discovered.² The closely allied genus *Hyloplesion* of Fritsch³ is distinguished by its short interclavicle with a long posterior process, by its more slender anterior ribs, and by the relatively smaller size of the ilium; and the remaining genera are excluded from comparison by equally obvious characters. Upon present evidence it is thus proposed to regard the Microsaurian from the Lancashire Coal-Measures as a species of *Hylonomus*; and as this appears to be new, it may appropriately bear the name of *H. Wildi*, in honour of its discoverer, Mr. George Wild, whose long-continued researches in the Burnley Coal-field, especially in connection with the Carboniferous Flora, are well known. Among distinctive specific characters may be enumerated the form and proportions of the mandible and dermal armour; while the precise contour, size, and ornament of the interclavicle will not improbably prove to be of diagnostic value when this element is discovered in the several species from Nova Scotia.

VII.—OBSERVATIONS ON A KEUPER CONGLOMERATE AND ON A BRECCIA, BOTH RECENTLY EXPOSED IN THE NEIGHBOURHOOD OF BRISTOL.

By T. Stock, Esq.

1. *A conglomerate in the Keuper.*—Whilst a drain was being cut in Argyle Street, joining Upper and Lower Eastvilles, one of the upper beds exposed consisted of a rather fine conglomerate, made up largely of rolled quartz pebbles of small size, compacted with rounded quartz sand and intermixed with coloured fragments (generally very small flakes) of softer shale or clays. I did not measure the thickness very carefully, but I should think that it did not exceed

¹ A. Fritsch, *Fauna der Gaskohle*, vol. i. p. 159.

² Sir J. W. Dawson, *Geol. Mag.* [3] Vol. VIII. p. 152.

³ A. Fritsch, *tom. cit.* p. 160. *Hyloplesion* is considered to be identical with *Hylonomus* by Credner (*Zeitschr. deutsch. geol. Ges.* vol. xxxvii. p. 734); but this identification is very doubtful, as lately remarked by Sir J. William Dawson (*Geol. Mag.* [3] Vol. VIII. p. 153).