

in coal-seams. During their deposition very numerous eruptions of felsite-porphry, melaphyre, palatinit, and porphyrite occurred, and formed dykes, intrusive layers, and tabular lava-flows (plattenförmige Effusionsschichten) between the sedimentary rocks" (p. 516). Further details of the stratigraphy are also given (*loc. cit.*).

I am glad to find my contention in the paper which appeared last February (Q.J.G.S.) supported by the establishment by Professor Bücking of the lithological identity of some of those rocks with igneous rocks of the Devon Permian; although, as an argument based on the assumption of a strict temporal order of succession among igneous rocks, it has not much weighed with me. I must remind Mr. Ussher that those, who know how the basis of our classification of the *Midland* Permian and Trias was laid for us by the labours of Prof. Hull in former years, can hardly be expected to admit his statement on p. 249, that "the *Midland* sections owe their importance as a basis for correlation entirely to the merits of the assumed correctness of their classification with reference to the German types." The fact that the Devon and *Midland* areas were at the time disconnected does not affect the question, as a careful study of my papers, and that of Prof. Hull (1892), will make clear to any candid mind; papers based on observations by no means limited to the coast-section.

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13th June, 1892,

A. IRVING.

#### CONE-IN-CONE STRUCTURE.

SIR.—Mr. Young's statement that "The apices are invariably turned to the under or lower side of the structure while their bases are as invariably directed to the upper surface,"<sup>1</sup> is certainly not of universal application. In addition to examples instanced by Mr. Harker,<sup>2</sup> from the *Lingula* Flags and *Lias* shales, I may mention specimens of my own of concretions from the pencil slates in *Swindale* and from Carboniferous shale in *Northumberland*, which exhibit a similar radial arrangement of the cones. But the beds which afford the most striking refutation of Mr. Young's statement are the *Coal* seams, for it is in these beds that the structure is by far the most extensively developed portions of some seams several inches in thickness being made up of these cones. Examination of numerous specimens from the coal fields of *Durham* and *South Wales* show two systems of arrangement of the cones—one, where the cones have formed at right angles to certain laminae of deposition and on *both* sides of such laminae which are  $\frac{1}{2}$ –1 inch in thickness, so that the apices of the cones above point downwards, whilst those below point upwards, both sets of cones having evidently formed outwards from the same set of laminae. But the commonest disposition of the cones, especially in the *Durham* seams, is *parallel* to the bedding planes, and although the apices often run for some distance pointing in a constant direction, cases are of frequent occurrence where the bases of the cones start back, the apices being directed away from each other.

<sup>1</sup> *GEOL. MAG.* for March, 1892, p. 138.

<sup>2</sup> *Op. cit.* May, 1892, p. 240.

I do not see how Mr. Young's theory of the origin of Cone-in-cone structure by the upward escape of gases bringing up from below successive layers of plastic mud can possibly apply to the bulk of such concretions.

E. J. GARWOOD.

FLEXIBLE SANDSTONE.

SIR,—I have read an interesting paper by Mr. G. W. Card, A.R.S.M., in the March number of the *GEOLOGICAL MAGAZINE* "on the flexibility of rocks," and as there have of late been several allusions to this subject in the press. I venture to bring the following facts under your notice.

About eleven years ago a friend presented me with a piece of flexible sandstone which he had brought from India. I, in turn, gave the specimen to my friend and chief, the late Mr. C. S. Wilkinson, F.G.S., Government Geologist of N.S.W.

Mr. Wilkinson was greatly interested in the peculiarities of the stone, and after devoting some time to their investigation he informed me that he felt convinced that the flexibility was due to the presence of interstices between the grains of sand, and to the interlocking of the latter. He believed the interstices to be due to the shrinking of the cementing clay by loss of moisture, and in order to test his theory he immersed the specimen in water, with the result that after some time it became rigid. After again thoroughly drying the stone he found that its flexibility was completely restored.

Mr. Wilkinson was in the habit of showing this specimen and explaining the cause of its flexibility to visitors for some years before Mr. Oldham's paper on the Delhi sandstone was written, and there is no doubt in my mind that to him (Mr. Wilkinson) is due the credit of first recognising the cause of the flexibility of the Indian sandstone.

EDWARD F. PITTMAN, A.R.S.M.

GEOLOGICAL SURVEY, N. S. WALES,

Government Geologist.

DEPARTMENT OF MINES, SYDNEY, 9th May, 1892.

OBITUARY.

STEPHEN AUSTIN.

BORN 1804. DIED 21ST MAY, 1892.

By the death of Mr. Stephen Austin, in his 88th year, the Editor of this Journal has been deprived of an old and much valued friend, whose name must also now be familiar to all his Contributors as the printer of the *GEOLOGICAL MAGAZINE*, since December 1865. The first two volumes (1864–65) were printed by Messrs. Spottiswoode & Co.; but the last twenty-seven volumes have been issued from the printing press of the well known firm of Messrs. S. Austin & Sons, Printers, Hertford, the excellence of whose work has largely contributed to maintain the reputation of this Journal during more than a quarter of a century that it has been in their hands.

This noted firm has been established in Hertford since 1768, having in that period passed through the hands of four generations of "Stephen Austins."