

I have neither seen nor heard of any other sclerotic plates having been obtained from British Carboniferous strata, and shall be glad to know if any collector of British Coal-measure fossils has obtained specimens from any British colliery or coal strata.

26, ARCHBOLD TERRACE,
NEWCASTLE-ON-TYNE, July 17, 1880.

T. P. BARKAS, F.G.S.

FOSSILS ON TRANSVERSE CLEAVAGE PLANES.

SIR,—Will you kindly accord me a little of your space to give publicity to certain observations which I have made upon the above subject?

The possibility of fossils occurring upon cleavage planes, when those planes do not happen to be coincident with the bedding, first occurred to me as a question in connexion with investigations made by me somewhat more than a year ago in the Culm-measure Limestones of Westleigh, in Devonshire. A (?) fossil seemed to occur on a (?) cleavage plane. This I showed to several competent judges, to whose opinions I should usually, and with good reason, readily yield. But in this instance opinions were conflicting. First, by some I was told that it was a fossil, and that *therefore* the plane on which it occurred was a bedding plane, not cleavage. Next, by others I was told that the plane was certainly a cleavage plane, and (*ergo*) that the supposed fossil was no fossil.

This set me considering whether there could be no *via media* in the matter. And I found, when I began to make inquiries, that better geologists than myself had observed similar phenomena, and confessed themselves to be perplexed by them.

I do not lay any great stress upon the Westleigh specimen. I confess myself to be very doubtful now about its organic origin, though at one time I held a different view. It, however, led me to make inquiries elsewhere, and through the kindness of Mr. H. B. Woodward, Mr. Kinahan, and Mr. W. Hughes of the Victoria Slate Quarries, Carrick-on-Suir, Ireland, I was furnished with specimens which were perfectly convincing as to the fact, account for it how we may.

The first specimens sent to me by Mr. Hughes from these Lower Silurian rocks showed Graptolites and Fucoids upon what he affirmed to be cleavage planes, but, not feeling quite satisfied about the matter, I wrote to him again, asking for details of the structure of the rocks, and pointing out, by means of drawings, that the cleavage which in one place was inclined at a high angle to the bedding might elsewhere, through the folding of the beds, become coincident with the bedding.

To this he replied by sending me a specimen in which both bedding and cleavage were shown. The former was shown by colour streaks, and upon the latter, inclined to the bedding about 80°, was a Fucoid impression. He says: "*In no part (of the quarry) are the bedding and the cleavage coincident.* We find the fossils occurring on the cleavage in different parts of the quarries, whatever position the latter may hold with regard to the bedding." He added also

that the fossils are “not always exactly coincident with the cleavage,” and one of his specimens illustrated this.

- I repeat, therefore, that there can be no question whatever as to the fact. I then set myself to work to account for it.

The first question which I proposed to myself was this, “How can fossils be deposited otherwise than on a plane of bedding?” And it appears to me to be no very difficult one to answer. Various exceptional circumstances might account for them in isolated cases; but for a common cause affecting a wide area of rock, we need only suppose tranquil conditions of deposit. Where there is absolutely no current and a soft oozy bed, shells, etc., would fall with the major axis in a perpendicular position, and in such a position they might probably remain. For some reason or other *Turrilites* is found “invariably at right angles to the stratification,”¹ in the Chalk-marl of the South of England. This is due, perhaps, in the first instance, to the fact that it is a Cephalopod; but it is evident that, if a current existed at the sea-bottom, the fossil would assume a horizontal position immediately after the death of the animal. That it has not done so proves tranquil conditions of deposit.

If we apply the same reasoning to a silty deposit, which has since been altered into slate, it will fully account for such organisms as sea-weeds and Graptolites being found inclined at a high angle to the bedding. Who ever saw a seaweed or Sertularian in a perfectly horizontal position in sea-water, unless perhaps in the tide-race? In still water the comparative buoyancy of their several parts would determine their position. And in such a position the silt would fall around them and entomb them.

The second question which occurred to me, and which is by no means so easy to answer satisfactorily, is this—“How came the fossils to be revealed in so many instances upon a superinduced structure like cleavage?” “How is it that the cleavage plane should happen to be exactly that in which those fossils lie?” I can only suppose that the slate rock at Carrick-on-Suir is in reality densely crowded with such organisms as Graptolites and Fucoids, a small per-centage of which are revealed by the cleavage. If the large majority of the organic remains which have been deposited there are deposited upon the planes of bedding, they are for ever lost to science, for the rock never divides along the bedding planes. The cleavage destroys all traces of the delicate impressions, except those (comparatively few) which happen to have been deposited exactly or very nearly along the lines which the cleavage afterwards followed. But we should expect to find some half revealed by lying imperfectly upon the cleavage plane, and this is exactly what we do find.

In some cases, in irregularly-cracked shales, I have seen cracks diverted, as to their direction, by the presence of a fossil, and perhaps the very selection of the divisional plane, dependent, as it would be, upon the line of least cohesion, may be determined here

¹ Science Gossip, 1879, pp. 204-5.

and there for a few inches by the surface of a fossil; but this, of course, is a distinct thing from regular cleavage affecting a large area of rock. In the latter case a coincidence between cleavage and the lie of a fossil could be but accidental, but that which is accidental may be of not unfrequent occurrence.

W. DOWNES.

FOSSILS IN HIGHLY CONTORTED AND CLEAVED SLATES
AND FLAGS.

SIR,—For many years the greatly cleaved and contorted Menevian strata of St. David's in South Wales, and of Dolgelly in North Wales, were deemed *wholly unfossiliferous*. At length by piecing together the slates and *looking at the bedding ends* of a number of them placed together in their *natural* position, Messrs. Salter and Hicks were fortunate in discovering a large number of fossils, revealing an entirely new fauna. Many of these fossils, which I remember to have seen, collected by the late Mr. Thos. Belt, F.G.S., and by Mr. John Plant, F.G.S., at Dolgelly; and by Messrs. Salter and Hicks at St. David's; reminded me of nothing so much as a fashion, which was greatly in vogue among elegant triflers and amateur painters, 40 to 50 years ago; of painting portraits and landscapes on the *edges* of books (often Bibles¹ were curiously enough chosen for this purpose). The single leaves themselves of course disclosed no evidence, but by pressing the book very slightly *obliquely* at the edges, a picture was at once revealed to the admiring gaze. The fossils may similarly be said to be, the pieced-together pages of old Cambrian records, cleaved into *blank leaves* by Time, but upon whose frayed and time-worn *edges* may still be deciphered a chapter in the life-history of our earth.

F. G. S.

¹ A Reverend Divine, who admired and loved the Queen greatly (as of course we all do), being a man of leisure and of a whimsical taste in art, painted *yearly* a very pleasing landscape, or other subject, upon the front edge of a handsome gilt 4to. Bible bound in Russia or Morocco, and sent it to the Queen on her birthday. These volumes with pictured edges, which extend over very many years of the early life of Her Majesty, are preserved in the Royal Library at Windsor Castle.

MISCELLANEOUS. — M. Delesse has published a useful agronomic map of the *Department of the Seine and Marne* (*Extrait du Bulletin des Sci.*, December, 1879: Paris, Jules Tremblay, 1880), which comprises the natural region of the *Brie*. In the above notice he has given some details respecting the mode of preparation and the principal results derived therefrom, the persual of which may be useful to those engaged in similar work. The map enables us to compare the revenue derived from the arable lands, the meadows, forests, vineyards, and shows how the fertility of the soil varies throughout the department, and also affords the means of appreciating the relation which exists between the physical and chemical characters of the vegetable soil and the geological structure of the district. It gives also the composition of the vegetable soil, which is further illustrated by two reduced maps appended to this short notice, one showing the lands with and without calcareous matter; the other indicating by different tints and curved lines the proportion of sandy residue corresponding to 20, 40, 60 and 80 per cent. in the soil.

J. M.

ERRATUM.—In Mr. W. H. Dalton's letter on "Post-Glacial," in July No., p. 333, line 11 from foot, for "Further deposits," read "Further, these deposits."