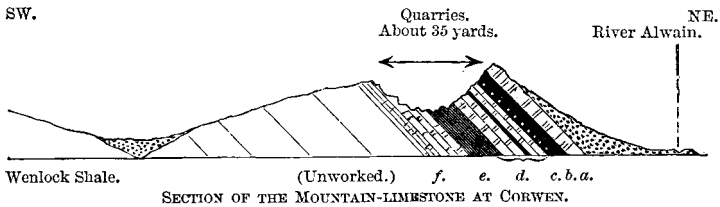


CORRESPONDENCE.

THE OUTLIER OF CARBONIFEROUS LIMESTONE NEAR CORWEN,
NORTH WALES.

To the Editor of the GEOLOGICAL MAGAZINE.

SIR,—A day or two may be spent with considerable pleasure and profit, geologically, in the vicinity of Corwen, North Wales, now easily accessible by rail from Llangollen. The hills of Wenlock Shale thereabout may yield fossils if well searched. The 'Tarannon Shale' of the Geological Survey contributes greatly to the boldness of the scenery. Five miles north-west of Corwen, on the Holyhead Road, there is a romantic waterfall in a patch of the 'Bala Limestone,' and diligent hammering in its immediate vicinity will be rewarded by many characteristic fossils. Nearer the village there is an outlier of the Carboniferous Limestone which is well worth the attention of geologists, both for its own peculiar features and fossils, as well as for the relation it bears to the main belt of that formation as it is developed on the North-Wales border.



- a. Limestone. b. Black shale with nodules, *Rhynchonella*, *Chonetes*, &c. c. Band of ferruginous nodules. d. Limestone (*Productus giganteus*, &c.), rather arenaceous, and with a shale band in the middle: 45 feet. e. Dark bituminous shaley beds, with stone bands, and layers of drifted *Producti*. f. Limestone beds, with *Phillipastraea radialis*, *Lithostroton junceum*, *L. fasciatum*, *Diphyphyllum latiseptatum* (?), and small *Producti* and *Terebratulæ*.

This outlier (see fig.) rises up out of a plain (in the midst of mountains) watered by the Rivers Alwain and Dee, and near to the confluence of the two streams. The locality is called Hafod; and supposing the wooden bridge over the Alwain is not swept away by a flood, as it was when I once visited the spot, you may reach it in about a mile and a half from the village; but, to prevent disappointment, it is better to keep to the Holyhead Road until you have crossed the bridge by which that road is carried over the Alwain, and then, turning immediately to the left, the quarries are reached directly. In order to understand the relation in which the outlier stands to the main band, it will be well to observe that the latter consists, in ascending order—first, of a series of pale-coloured beds, much quarried for fluxing material; second, a number of layers of hard grey limestone; and, thirdly, an alternation of beds of limestone and shale, and black dirt, abounding with fossils. The beds quarried at Corwen correspond to those in the upper portion of the main band; the dirt and shale-beds, together with the fossils found,

all serving to confirm the identity. There is a slight lithological difference, however; one portion, marked *d*, differing from beds in the like position in the main band, in the paleness of their colour and the admixture of a considerable quantity of sand; for which reason, by the way, this limestone is not so highly esteemed for agricultural purposes as the former. The beds are perched up at very great angles; the lower beds are not worked; but, by measuring the out-crop of the strata, it is evident that we have the whole series of beds as developed in the main band, corresponding in general order and character, though differing in one or two minor lithological features.

The question arises, does this outlier owe its isolated position to the denudation of beds by which it was once connected with the main band, or to the operation of the same causes which led to the deposition of the latter, *working in a limited area*?—in other words, was it once connected with the main band, or was it originally deposited apart from the rest? The theory of denudation is now in considerable favour; and I find that, in a former number of this Magazine, Mr. Jukes expresses his belief that this very outlier formed part of the ‘whole Carboniferous series, which at one time covered a great part of Wales;’ the remaining portions, and those once connecting it with the main band, having been washed away. It may savour of presumption to differ from so great an authority; and yet, knowing the country as I do, I am compelled to dissent from such a notion. Let us look a little more closely into the matter. The Carboniferous Limestone of the North Wales border is between 300 and 400 feet in thickness, the bulk of it consisting of limestone proper. The outlier near Corwen is distant about eight miles from the nearest point of the main band. Without assuming, as Mr. Jukes would, that the whole Carboniferous series once covered nearly the whole of North Wales, let us suppose that the main limestone once extended along its whole course of forty miles, eight miles only beyond its present outcrop, we have then a deposit of limestone (to say nothing of the other members of the Carboniferous group), 350 feet or thereabouts in thickness, covering an area of 320 square miles. Now it is quite evident that, if this mass of calcareous matter has been swept away, it has been redeposited somewhere else, in the newer formations. If it has been denuded, have we any indications of the course it took—of the locality where most of it at least would be deposited? Is there in any of the newer formations any deposit analogous to it? Let us see. The pebbles in the Millstone-grit, those in the sandstones of the Coal-measures, those in the Permian and Trias, and notably the materials of the ‘Drift’ on the Welsh border, and in the plains of Salop and Chester, all indicate currents running eastward. With reference, then, to the particular district under notice, in this direction we should look for this denuded and redeposited matter. And in the extensive plains of Shropshire and Cheshire, which lie between the eastern development of the Carboniferous strata in Derbyshire, Stafford, and South Shropshire, we ought, if anywhere, to find these denuded mate-

rials. Now, supposing the denudation to have been slow, we should expect to find similar deposits of limestone and shale formed from the denuded matter; or, supposing the denuding agency to have been strong and the action violent, in that case we should expect fragments and boulders of limestone, and their embedded fossils, together with the solid organisms from the shales, in the redeposited strata. I am bold to say, however, that throughout the whole region referred to, the search would be vain for any such deposits, or beds containing redeposited Carboniferous fossils, while the surface-drift does not contain such a proportion of calcareous elements as would lead us to favour such a theory: indeed, the whole mass of Drift is not more than might be expected to result from the scooping out of the Welsh valleys, mixed up, as it is, with the materials derived from the north. Or, if it should be urged that the redeposited matter has been so acted upon by chemical or other agencies as to destroy its identity, or that it has been carried away nobody knows where—both of which are extreme propositions,—is it at all likely that the solitary remnant of the Carboniferous rocks which once covered the district referred to would be the outlier at Corwen? Is it at all likely that, while all the surrounding strata were swept clean away, this little patch would be left intact, to the very top of the series?—would there not in sheltered spots linger relics of the old time to tell of that which once had been? May we not have reason to expect that, mixed up with the local Drift of the Welsh valleys, there would be no lack of Carboniferous *débris*? Is it at all likely that over so extensive a district ‘the house would be swept so clean’ as not to leave even a faint trace of its former inhabitants? Yet such is literally the case, if this theory be true. Once passing the outcrop of the main ridges, which, like a line of reefs, sweep round the eastern and northern sides of North Wales, you fail to discern fragments of the Carboniferous rocks in the local Drift, and not a trace of this supposed Carboniferous envelopment occurs *in situ*, save the outlier at Corwen. It may scarcely be admissible as evidence, but I cannot help saying that the general *contour* of the country, and the appearance of the present limestone escarpments, bold and well defined to the very top, capped as they are with their shale and fossiliferous beds, and overlying hills of Millstone-grit, are incompatible (to my mind at least) with the idea that a whole Carboniferous system has been swept away over their heads.

From these, as well as other considerations, though I too may be exposed to the charge of being narrow, and of cherishing ‘auld waird’ notions of Geology, I must for the present look upon the plain about Corwen as having been once a little inland sea, in which the deposition of the limestone of the outlier went on simultaneously with that of the main band, but apart from the latter.

The search for fossils will be most successful in the shale-beds, both *in situ*, and in the ‘heaps’ into which these have been thrown out of the way of the quarrymen.

Yours, &c.

D. C. DAVIES.

OSWESTRY.