

## CORRESPONDENCE.

## THE AGE OF THE PENNINE CHAIN.

SIR,—The Number of the GEOLOGICAL MAGAZINE for November contains a very thoughtful paper by Mr. Wilson, F.G.S., on the age of the upheaval of the Pennine Chain or “Backbone of England,” in which he controverts my views regarding the precise epoch of primary upheaval, and comes to the conclusion that it was Pre-Permian, instead of Post-Permian and Pre-Triassic; the conclusion I had previously arrived at. He has very fairly stated my arguments and his objections to them. With the time at my disposal, it would be impossible for me to recall all the facts and inferences which were vividly impressed on my mind at the time I wrote the paper on this subject to which Mr. Wilson refers.<sup>1</sup>

The arguments are there, and every one must judge for himself whether they are conclusive or not. I admit the force of Mr. Wilson’s inference, that there must have been *some* westerly uptilting of the beds of the Yorkshire Coal-field before the Permian period, from the well-known fact that the Coal-measures dip at a slightly greater inclination towards the east than does the Magnesian Limestone which overlies them. This dip is, however, but slight, because it only amounts to the difference between the inclination of the two formations; and I suppose it to be due to a sort of sympathetic movement which took place during the progress of the more powerful east and west flexuring at the close of the Carboniferous period.

The principal objection to Mr. Wilson’s reasoning seems to lie in his statement that the Permian beds on either side of the Pennine axis were originally disconnected, and on this he bases one of his arguments for supposing the existence of the disconnecting Carboniferous ridge during the Permian period. To this view I entirely dissent, on grounds which I have stated at some length in a paper which Mr. Wilson seems to have overlooked, and perhaps with some reason, considering its title.<sup>2</sup> In that paper, I call attention to the remarkable resemblance between the Permian formation as it occurs in Lancashire, and the same formation as it occurs in Yorkshire and Durham, which strongly impressed me with the conviction that there could have been no intervening barrier between the two areas. Mr. Binney, and, still later, Mr. Kirkby, have shown that the fossils of both districts are truly representative of each other, and deposited in the same general basin, although under somewhat different conditions—the Upper Permian beds of Lancashire having been formed in shallower waters and in a sea somewhat clouded by muddy sediment. Though quoted by Mr. Wilson as one of the authorities for the statement that “there is no similarity

<sup>1</sup> Quart Journ. Geol. Soc. vol. xxiv. p. 323 (1868).

<sup>2</sup> “On the Evidences of a Ridge of Lower Carboniferous Rocks under the Plain of Cheshire, etc.,” Quart. Journ. Geol. Soc. vol. xxv. p. 171.

either in character, thickness, or succession of the Permians on the opposite side of the Pennine Chain," I quite dissent from his way of putting my views, except in the matter of "thickness," which is of very little importance in an inquiry of this kind. On the contrary—both in Yorkshire and Lancashire—we have Upper Permian beds represented by Magnesian Limestones with identical fossils, and Lower Permian beds, consisting of soft sandstone of very great thickness at Stockport and elsewhere, close to the edge of the Pennine Chain.

I cannot consent "to omit from consideration" the "Lower Permian Sandstone" as Mr. Wilson wishes us to, on the ground that "its true horizon seems doubtful." There is really no such doubt, as, both at Manchester and Stockport, these sandstones have been proved to rest unconformably on the Coal-measures on the one hand, and be overlain by marls with limestone containing Permian fossils on the other. Then, again, both of these formations are unconformably overlain by the New Red Sandstone, as was clearly proved by the borings at Heaton Mersey, below Stockport, and other places. I must repeat, therefore, that there can be no question that the Lower Red Sandstone of Stockport is the representative of the Lower Red Sandstone of Durham and North Yorkshire; for they agree both in position, character, and their relations to the adjoining formations—both above and below.

If this be so, I would ask Mr. Wilson how can he account for the fact that this Lower Permian Sandstone is remarkably free from fragments of Carboniferous rocks, or, indeed, of rocks of any kind, if it was deposited at the base of a Carboniferous ridge?

As I have already shown, in the paper just quoted, the differences in the characters of the Permian rocks in the N.W. and N.E. of England are those of degree rather than of kind, and may be accounted for on the law, or principle, which will be found to characterize many natural groups or formations; namely, the development, in opposite directions, of calcareous and sedimentary strata.<sup>1</sup> The real Carboniferous barrier of this period lay below the Cheshire Plain, reaching the Carboniferous tract along the valley of the Dane, near Bosley. To the north and south of this ridge the Permian beds were connected more or less across the country.

In conclusion, I cannot admit that the absence of such a thin and local formation as the Marl-slate of the North-east of England in Lancashire or Cumberland is of much importance in this inquiry. I can point, on the other hand, to real Magnesian Limestones at Skilaw Clough, and two or three other spots, as evidences of connexion between the east and west. I do not therefore see sufficient reason for altering the conclusion to which I have already arrived, while I admit that both points of view—that held by Mr. Wilson, and by myself—have their difficulties.

EDWARD HULL.

<sup>1</sup> *Ibid*, p. 176.