

the late Mr. D. Sharpe, and have myself more than once suggested to geologists, but as yet, I fear, without much success, that the laminar structure of the metamorphic schists is owing to the same cause—gneiss being only a *squeezed granite*.

G. POULETT SCROPE

FAIRLAWN, COBHAM, SURREY, June 5, 1868.

ON FAULTS AND CONTORTIONS IN STRATA.

SIR,—I read with considerable interest a short paper in your May number, by Mr. J. M. Wilson, attempting to explain the causes by which contortions and faults are produced. Mr. Wilson's theory, that "contortions are the inevitable result of the depression," and "faults of the elevation of a curved surface," from its soundness and simplicity is likely to be generally accepted; at the same time I do not think that all faults or contortions can be ascribed to the operation of one universal cause. In the first place, if such were the case, should we, according to Mr. Wilson's view, *ever* find that the direction of the fault *hades* (underlies) in the direction of the *upthrow*? Such cases do occur, though they are exceptional. Secondly, according to Mr. Wilson's theory of faulting, the elevation of a very extensive area of the earth's surface is necessary for the production of a complete series of upthrows and downthrows, as shown in Fig. 4, p. 207, GEOLOGICAL MAGAZINE. Now I have lately met with such a series in a horizontal line, 136½ feet long, in the Upper Red Marls of the Keuper Series, Nottingham. It occurs on the brow of the hill near the Mapperley Reservoir, and is well shown in a road cutting. I enclose a rough sketch of the section. I think there can be no doubt that the cause which produced that faulting acted locally, and if that cause were the elevation of a curved surface (which perhaps may have been the case), that curved surface was not due to the curvature of the earth's surface, for over an horizontal area of 45½ yards there would be no appreciable curvature from such a source. If the faults had all been vertical, or inclined in parallel directions, I should have been inclined to adopt Sir C. Lyell's theory of cavities, but on a smaller scale, such, for instance, as might be caused by the carrying away, by percolating water, of salt, gypsum or other mineral in chemical solution, or, under certain circumstances, in mechanical suspension. The sinking of a stratum into a cavity could produce such faulting as shown in Fig. 1. For the present case I would suggest the following explanation in want of a better :—

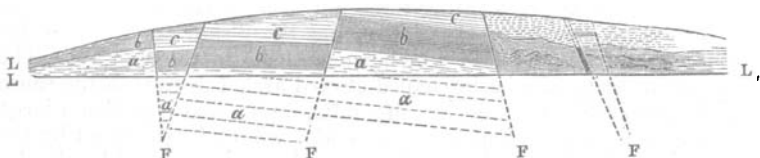


Fig. 1. Section of New Red Marls, Mapperley Road, Nottingham. Average height of section, 5 feet 4 inches. Total length, 136 feet 6 inches. Greatest amount of faulting ascertainable, 2 feet 6 inches. L, L., Level of the Road. The strata on the right of section are obscured by distortion and exposure to the atmosphere. F F F lines of faulting. The letters *a a*, *b b*, *c c*, indicate the portions of the dislocated beds which were once continuous.

I mentioned that the section as shown in Fig. 1 lies at the top of a hill between two faults, as shown in plan (See Fig. 2). Not that the district between the two faults is a continuous ridge; there are other ridges with dry, irregular valleys between. I think there can be no doubt that the space between the two faults has been raised higher than the outlying district so short a time ago (geologically), that the country within the faults has since that time preserved a relative, if not an absolute similarity of contour, with that outside the faults.

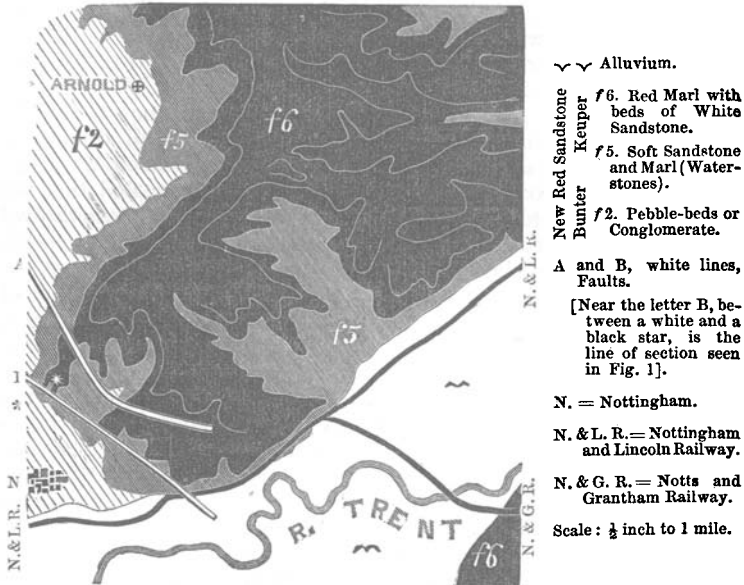


Fig. 2.—Sketch-map of a portion of the District near Nottingham, showing the position of the Faults in the Red Marls of the Keuper and Bunter.

Therefore, upon such elevation, perhaps that last one which gave the country its present contour, subject to subsequent denudation, we should have the data for the elevation of a curved surface (not due to the earth's rotundity) producing the faultings shown in Fig. 1. These minor faultings, as far as a mere section across their direction can show, seem to run parallel to the larger, including faults. I have spoken of valleys between the ridges. Would the elevating force act also on the inverted arches those valleys formed? Clearly so; but the results would differ, for faults would be produced which would hade to the *upthrow*. The elevation, then, of a basin-shaped curved area I believe is the cause of the production of this class of faults, on a small if not on a large scale. It is also evident that contortions would be produced by the elevation of an inverted arched area, as they are produced by the depression of an arched area.

I understood from Mr. Wilson's paper that the faults will not take

place unless the area is depressed beneath the sea, and that marine denudation will obliterate all trace of such faults at the surface. But surely if we are to call in wide areas of upheaval, we cannot limit the effects to a marine area any more than we could to a terrestrial area. No doubt at the present day there would be just so much the greater chance of a marine area being raised, as extensive oceans preponderate over extensive continents. Certain great faults have left their impress on the configuration of the country, and if that impress is modified, it is sometimes as much by subaërial as marine denudation. The Bala fault might be quoted as an example.

ED. WILSON.

NOTTINGHAM, June, 1868.

ON THE DEVELOPMENT OF THE LOOP IN THE TEREBRATULIDÆ.

SIR,—In your last number, Mr. C. J. A. Mejer, in a paper on Cretaceous Brachiopoda, offers some observations on the loop of *Waldheimia*, *Terebratula*, *Terebratella*, etc.

I do not wish to enter into a discussion on the desirability of separating the two former generically, the greater or lesser extension of the loop being their only distinction, but simply to say that the correctness of the figures given in my paper on "The Development of the Loop in *Terebratella*," *Geologist*, vol. iii., pl. xii., figs. 1-4, does not admit of a moment's doubt. They are not, as suggested by Mr. Mejer, very minute; and as, in the examples figured, the loops are entirely free from the matrix, they can be studied with the greatest advantage. The original sketches of the loops having been carefully drawn by Mr. Davidson will be a sufficient guarantee that they are correct.

However difficult may be the question of a change in the calcified interiors of some of the Brachiopoda, it is quite certain that with the *Terebratella Buckmanii* we have a series of shells, none of which can be separated by their external conditions, but which have notwithstanding different forms of loops; and it will be necessary either to accept the suggestion that they are different stages of growth, or else to create separate *generic* designations for shells that cannot by their outer forms even be distinguished specifically. There is little doubt that had they been obtained singly from different formations the former would most probably have happened.

It may interest some of your readers to know that I have just found the genus *Thecidium* in one of the lead veins of the Carboniferous Limestone of Yorkshire, it not having been met with hitherto in England below the Lias, or on the continent below the St. Cassian Beds. The precise age of the vein yielding it will yet have to be determined.

CHARLES MOORE.

BATH, June 18, 1868.

DENUATION NOW IN PROGRESS.

SIR,—In the very interesting and able article in your last number, "On Denudation now in Progress," by Mr. Geikie, he has omitted to take into consideration some circumstances of a restorative character