

compelled to believe that the existing drainage-lines were defined before the present topographical features had been uncovered in the process of denudation. This inference is confirmed by a study of the river-systems.

Three chief rivers drain the Midland Valley,—the Tay and Forth from the Highland side, and the Clyde from the side of the Southern counties. The Tay issues from the Highlands by the narrow defile of Birnam and crosses without deflection the line of the great boundary fault. It then winds across the Old Red Sandstone plain as far as Perth, where the ridge of the Ochil Hills runs on into that of the Sidlaws. Instead, however, of circling round this ridge, the river continues its course right across it, and then bends to the east and enters the Firth. Its tributary, the Earn, a little way farther south likewise cuts through the same ridge. The careful mapping of the Geological Survey has detected evidence of a probable fissure in the defile of the Earn, the Upper Old Red Sandstone being there brought down against the older volcanic rocks (Fig. 78). The gorge of the Tay, however, appears to be entirely due to erosion by the stream itself.

If, then, the chain of the Sidlaws once ran unbroken to the south-west, through the Hills of Kinnoul and Moncrieffe, into the range of the Ochils, of which geologically it is a prolongation, how could the Tay trench it? Two explanations may be suggested. The ridge of hills may have been cut across to a certain depth by two streams eating their way back towards each other, in the manner already pointed out as at work to the north of the Cromarty Firth. The transverse hollow thus formed would become a strait during a subsidence of the land, and might be considerably widened and deepened by the sawing action of the waves, until, after repeated changes of level, the trench was cut down so low