

we turn, we seem to be able to explain the facts in one way only, namely, by the violent action of water, which, when we consider the continental nature of the phenomena to be explained (proving continuous conditions over wide areas), must have been on an overwhelming scale. Wherever we turn over a vast continent, we find the evidence uniform. The ossiferous gravels of Germany and England, the sheets of sand in Scandinavia, the diluvium in France, the loess in Central Germany, differing in texture and in contents, all merge into one another, all have the same character of mantling the country with continuous deposits independent of the configuration of the surface and of the drainage, and, whether we test them individually or grouped together, point an unmistakable moral, namely, a wide-spread diluvial movement, and there seems to be no possible argument against it save a number of metaphysical phantasms about Uniformity, worthy only, may I say with all deference, of the period when the *à priori* problem of a chimæra disporting itself *in vacuo* was deemed a reasonable subject of Philosophical investigation.

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NOTICES OF MEMOIRS.

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THE ROCKS IN THE NEIGHBOURHOOD OF PLYMOUTH AND THEIR STRATIGRAPHICAL RELATIONS. By RICHARD N. WORTH, F.G.S.

MR. R. N. WORTH, F.G.S., read a paper on "The Rocks in the Neighbourhood of Plymouth and their Stratigraphical Relations," at the recent meeting of the Devonshire Association at Exmouth. Pointing out that there was now abundant evidence of the existence of granitoid rocks in the Channel area off the South Coast of Devon and Cornwall, with which the gneissic rocks of the Eddystone Reef were associated, Mr. Worth traced the influence of these rocks into Plymouth Sound. Portions of the Shovel Reef on which the Plymouth Breakwater was partly founded were asserted to be gneiss; and whether this was so or not, there was ample evidence of metamorphic action on the shore rocks of the Sound, especially on the east, in the immediate neighbourhood of the presumed gneiss; in addition to the evidence of the near presence of such an intrusive granitic boss as that which probably caused the metamorphosis of the Eddystone Reef, and the rocks of the Start Point, which was to be found in the extraordinary displacements and contortions of the Staddon and Bovisand rocks. There was more direct evidence also of the existence of granitoid rocks in the immediate Plymouth district, in a boss of rocks at St. Budeaux, of very limited area, which seemed to form a kind of connecting link between the granite of Gunnislake and that of the Channel, and apparently indicated the existence of a granitic spur from the main granitic axis of the western peninsula.

The confusion into which the rocks of South Devon had been thrown was largely caused by the upheaval of the Dartmoor granite,

originating an enormous vertical and lateral displacement, the extreme thrust of which was taken by a rocky buttress occupying what is now the Channel area,—itself probably an active agent. Where these two forces more nearly approached each other, folding and repetition would be most marked; while the widening of the space between the moorland and Channel axes would be accompanied by an expansion of the folds, and lead after denudation to greater irregularity of stratigraphical relationship. It was in the Plymouth district that the Devonian rocks of South Devon were pinched to their narrowest limits; and he believed that they supplied the key to the area generally.

Dividing these rocks into three series—the slates, etc., underlying the limestones; the limestones; and the overlying slates and sandstones;—Mr. Worth again subdivided the lower group into—(a) slates with metalliferous veins and elvans; which he called, from the locality of their greatest development, the Buckland and Bickleigh beds; (b) slates with interbedded volcanic matter—the Weston and Compton beds; (c) purple and green slates—the Mutley beds. All these, with the overlying limestones, belonged to the Middle Devonian; and were to be correlated with the Ilfracombe group of North Devon. Except in the immediate vicinity of the limestone, none of these beds were fossiliferous.

The slates overlying the limestone on the east of the Sound (and practically on the west also) appeared to belong to the Morthoe group. The Staddon and Bovisand grits and associated beds seemed to be faulted down and in all probability represented the Pickwell Down sandstones. Associated with these, but the conditions of association not very clearly made out, were highly fossiliferous slates, in some respects strongly resembling those of South Petherwin.

Mr. Worth suggested that all these groups might be traced folding round the granite in South Devon and East Cornwall; and that detailed mapping would render the connection clear, while without it nothing could certainly be done. However scattered the South Devon limestones might appear, he believed they belonged essentially to one horizon.

Going westward from Plymouth, Mr. Worth believed that there was a well-marked descending series, and that the east of the county of Cornwall only could be treated as Devonian. The existence of Lower Silurian rocks on the South Coast of Cornwall was admitted on all hands; and Mr. J. H. Collins, F.G.S., had adduced what seemed conclusive evidence that Upper Silurians extended across the county, and that the rocks in the mining district of West Cornwall were Cambrian or at least pre-Silurian.