

the centre of the earth and formed by settlement of disaggregated particles from a suspension. Writing of bedding planes formed in this way, Arbuthnott proceeds:

*"I shall beg leave to add one reason why I think they would not be smooth a-top, and that is . . . to make them smooth [i.e. planar] each solid Column, or to speak more properly, each truncated Sector must have been of the same bulk and the Matter of the same density; of the same bulk, else there would have been outward or inward Inequalities, where there was a difference in Extension; and of the same density, else the several columns could not balance themselves exactly in the subsidence, but one would have been higher than the other; both then would have provided Mountains and Valleys. Now since there were antediluvian Mountains it would seem that the Columns of the Earth had not been made up of Matter with both the aforementioned Properties."*

Thus Arbuthnott stated the conditions for the existence of a perfectly uniform spherical shell forming the outer skin of a uniform sphere containing a concentric perfect spherical cavity. He recognized that the surface of this inner sphere constituted what a modern geophysicist would call the surface of compensation and that mountains and valleys could occur above it if they formed the summits of columns of different density. This corresponds to Pratt's isostatic model. He also came near to Airy's conception of isostatic balance when he realized that sectors of equal density differing in bulk would result in "outward or inward Extensions". Had he replaced "or" by "and" the likeness to Airy's model would have been complete.

It is interesting to see how this penetrating critic thought along the same lines as the founders of the modern notions of isostasy, a century and a half before the basis of that fruitful conception was presented to geologists.

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#### THE MAAM FAULTS, CO. MAYO

SIR.—Professor J. G. C. Anderson remarks (*Geol. Mag.*, 1960, xcvi, p. 511) that the north-westerly swing of the Wenlockian strike west of Cregganbaun is not "undoubtedly" related to the Maam Faults. The map (Pl. XIX) in a recently published paper on the Ordovician between Cregganbaun and Killary Harbour (Stanton, 1960) clearly shows them to be due to one and the same cause, the Maam Disturbance. As described in the paper, this is a north-westerly trending vertical shear zone at least 25 miles long with a dextral displacement of 1.7 to 3.5 miles. In the rigid Mwaelrea Grits the Disturbance is represented by the Maam tear faults, but on passing into the incompetent slates and greywackes of the Glenummera Slates and Sheefry Grits the faults die out and are progressively replaced by a zone of flexure (c.f. the upper and lower boundaries of the Glenummera Slates). Here both strata and cleavage swing round to the north-west, the strata being attenuated and the regional cleavage being accentuated to the point of schistosity. The Wenlockian strata west of Cregganbaun cross the Maam Disturbance and are involved in the flexure; hence their change of strike. The displacement of the Wenlockian caused by the flexure is rather more than 2 miles, which is normal for the Maam Disturbance.

Professor Anderson suggests that: "the Maam fractures in fact . . . developed very late and may in fact be due to post-Carboniferous N.-S. Armorican compression; the arcs, on the other hand, are pre-Carboniferous." Since the Maam Disturbance caused the simultaneous formation of both the Maam Faults and the Cregganbaun are this statement must be in error. In fact, the evidence from the Ordovician south of Cragganbaun indicates that the Maam Disturbance developed in step with the regional folding. To quote only two examples: there is no sign in the Sheefry Grits of distortion of the regional Caledonian cleavage such as would result from later large-scale

shearing ; and the many acid dykes in the flexure near Cregganbaun, although mostly well-cleaved, include a number of uncleaved dykes (Stanton, 1960, p. 289). Movement on the Maam Disturbance thus seems to have ceased before the final stages of emplacement of the Corvock Granite, from which the acid dykes derived.

There is strong evidence (Stanton, 1960, pp. 278, 282 ; Fig. 2) that preliminary movements on the line of the Maam Disturbance, between Ben Gorm, Fin Lough, and Ben Lugmore, took place during the deposition of the Mweelrea Grits. As the Disturbance is approached from the west both the First and Second Slate horizons thin out remarkably, but immediately the fault zone is crossed they reappear at maximum thickness, and an extra slate horizon is present overlying the welded tuff bed T.B.5. At this locality T.B.5. was involved in contemporaneous slumping, the only case of slumping affecting a Mweelrea Tuff Bed in the whole area. These facies changes were probably caused by downthrow to the north-east, repeated at least three times, along the line of the Disturbance. Far from being a late feature, therefore, the Maam Disturbance was already affecting sedimentation in the Middle Ordovician.

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#### REFERENCE

STANTON, W. I., 1960. The Lower Palaeozoic rocks of South-West Murrisk Ireland. *Q.J.G.C.*, cxvi, pp. 269–296.

SIR,—Dr. Stanton's letter provides an example of the kind of misinterpretations that can arise through considering structural events on a local rather than a regional basis.

The Maam Fault is only one of a system of transcurrent faults in South Mayo which are later than the regional schistosity and two phases of the regional folding, although a late cleavage may be locally produced along them. In fact, the Maam Fault itself, continued north-west, dextrally displaces the Highland Boundary fracture-zone and the Old Head Series (Old Red Sandstone) by about four miles which is of the same order as the movement recognized by Dr. Stanton further south.

That some of the acid dykes near Cregganbaun are not schistose is no proof that they are later than the fault. Where these dykes were unaffected by the regional metamorphism they would resist fault-cleavage just as have some of the quartzites of both Ordovician and Wenlock age. If the Cregganbaun flexure is caused mainly by the fault, it is curious that an equally marked bend south of Croagh Patrick should have developed without any such fault, and also that other faults of the same system should not have produced flexuring.

As the fault is transcurrent it is not surprising that there should be a change of facies across it. The possibility cannot be excluded (as with many other such faults) that the fault follows an ancient zone of disturbance but it cannot be accepted that the main movement was pre-Old Red and responsible for the bending of the post-Wenlock folds; the bending of the folds is due to cross-folding which is also identifiable in the minor structures.

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