

(5) It is misquoting to say I speak of a *rising* of the coast here. The rise preceded the movements in Table 2 and the last column shows the irregular subsidence. Fig. 15 is an attempt at the difficult task of illustrating the suspected movements: it is drawn to show sea-level rising and falling because the beaches are disposed in that manner, but the curve must be inverted for the land movements—

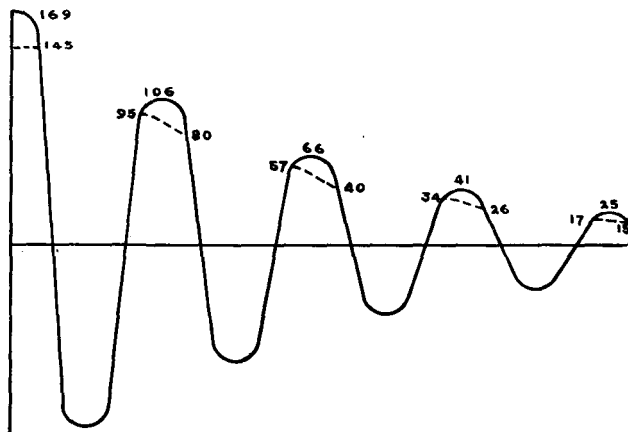


FIG. 15.

Spain in full and France, where it varies, in dotted lines. In another manner, the difference in behaviour can be appreciated if a soft rubber ball is placed on a table and one's hands held thumb to thumb palm downwards at some distance above it, the left to represent Spain, say, and the right France. Both hands are brought down together, the left on to the table and the right on to the ball which first gives way to a certain extent and then—if allowed—raises that hand a small amount; cf. p. 516, "as if a substratum had an elastic quality."

(6) Suggestions are welcome, but after examining Fig. 4 and Table 1 I do not think the first suggestion will be widely received.

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PETROLOGY AND THE WESTERN RIFT OF CENTRAL AFRICA.

SIR,—In the article by A. W. Groves in the *GEOLOGICAL MAGAZINE* for November, 1932, a very careful and satisfactory petrological account of certain features of the old rocks of Uganda in the vicinity of the Western Rift is given, about which there will probably be little difference of opinion. The interpretation of these characters in relation to Rift movements appears, however, to be far less *satisfactory and by no means convincing*.

One would readily agree with Dr. Groves in his observations on

pp. 498 and 499 that the "mortar-structure", microscopic thrusts, and mylonization have been brought about by some severe earth movements, subsequent to the cessation of conditions of plutonic metamorphism, that is to say, after the rock had been brought by denudation nearer to the surface, but when he later refers the period of this and other changes, such as the conversion of hypersthene into garnet and the production of garnet-amphibolites from dolerite dykes, to mid-Pleistocene and Recent times his deductions seem open to question. They certainly do not conform with observations made in Tanganyika Territory by the members of the Geological Survey.

The specimens described presumably came in some cases from places at or near the present surface, which cannot be very different from that which prevailed in mid-Pleistocene to Recent times. According to Groves's contention, therefore, there cannot have been much lowering of level by denudation since these cataclastic structures and mineral changes took place in the rocks described. The relatively small amount of progress in rejuvenation in many stream courses on or near the scarps is clear evidence of the insignificant amount of peneplanation since the Rift troughs were formed. Is it reasonable to assume that such profound structural changes took place at such shallow depths? It is perhaps significant that the features described are all confined to the old crystalline rocks of the Basement Complex. Have any corresponding structures been noted in younger rocks, either igneous or sedimentary, of Paleozoic, Mesozoic, or even early Tertiary age?

So far as I am aware, such evidence is markedly absent concerning the rocks along the margins of Lakes Tanganyika, Rukwa, and Nyasa.

In the Lupa goldfields, an area lying between two powerful scarps and where most detailed examination has been made in Tanganyika Territory, mylonization and other shear phenomena similar to those described by Groves are well developed, but it is clear that these features are very ancient and long antedate the present scarps which cut across the old lines in nearly every case. One would like to see more evidence quoted from observations relating to the later rocks of Uganda. It cannot be doubted that the features described are due to extensive compressional forces, but, unless the period when these were imposed can be more satisfactorily established, I would hesitate to accept them as having anything to do with tectonic movements of so late a period as mid-Pleistocene to Recent.

My own experience in Tanganyika Territory is that they are much older than the Rift fractures which everywhere are best interpreted as associated with block movements.

I would like to add some remarks by Mr. G. M. Stockley, who has done a considerable amount of field work in the neighbourhood of the Nyasan Rift Valley in the South-West Highlands.

“The facts that were noted are as follows :—

“(1) Compressional movements bringing about mylonization of the pre-Muva Ankole and, I think, Waterberg formations. Mylonites are found in the Livingstone Mountains associated with the highly contorted and overthrust rocks, but it should be noted this movement came from the direction of the Lake, *not towards the Lake*. Bailey Willis considered Lake Nyasa to be a natural Rift Valley caused by tensional movements and block-faulting. The age of these mylonites and the movement cannot be later than Devonian since the adjoining Karroo rocks are not affected.

“(2) The Ruhuhu trough is older than the Nyasan, as it is cut across by the later Rift. Again mylonites are found on the northern portion of the area in the Upangwa Mountains. These form the southern section of the Livingstone Mountains. It is evident that if the Ruhuhu trough was formed by compressional forces, then the whole of the Karroo lying between the walls of the piled up ‘compressed’ mountains must give innumerable evidence of folding and buckling. No such evidence was observed. The whole depression is a type-tensional region. Block-faulting is everywhere evident.”

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