

## CORRESPONDENCE

## LINEATION IN HIGHLAND SCHISTS

SIRS,—In the January–February number of the *Geological Magazine* for the present year Dr. Coles Phillips publishes a letter in which he concludes that Dr. D. B. McIntyre has shown confirmatory evidence of speculations which he himself had made concerning the course of lineation south-east of the Great Glen.

While not denying this, I should like to call attention to a sentence which he quotes from an article by Dr. McIntyre in a previous number of the *Magazine*. “The direction of movement is clearly perpendicular to the lineation, and not parallel to it, as Hinxman assumed. The striping is a *b* lineation.” If this statement had been put forward as a suggestion, no objection could perhaps have been raised. As it stands, however, it implies that the relation has been proved, and this is far from being the case.

After careful reading of all Dr. McIntyre’s articles I am unable to see that any of them contains more than a suggestion. The only direct proofs so far published, as to the relation of lineation and movement, appear to me to be the following: (1) The evidence given by A. Kvale in 1945, in his paper “Petrofabric analysis of a quartzite from the Bergsdalen quadrangle” (*Norsk Geol. Tidssk.*, xxv, 193); and (2) the evidence derived from the elongation of pebbles in deformed conglomerates. In the first case the conclusion seems to be open to no challenge whatever that the lineation and the direction of movement are parallel.

In Scotland there are unfortunately no cases of deformed conglomerates occurring in conjunction with lineation, such as might prove either case. In the paper which I read to the Geological Society in 1948, however, “On lineation and petrofabric structure, and the shearing movement by which they have been produced” (*Quart. Journ. Geol. Soc.*, civ, 99), I mentioned two instances from the Erzgebirge and one from New Hampshire, in all of which the greatest elongation is parallel and not perpendicular to the lineation.

Dr. Phillips must be aware of these cases and cannot assume that all lineation is in the *b* direction, and transverse to the direction of shear. More probably he supposes that in different circumstances an *a* or a *b* lineation may result. This opinion was expressed by more than one speaker in the discussion which followed my 1948 paper. The character of the “simple shear” which produces the two types had been very carefully defined and cannot explain the difference. The same physical cause must, therefore, one must suppose, give rise to very different results. That both an *a* and a *b* lineation can be produced by it appears to me to be an absolute impossibility.

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16th April, 1951.

## ATLANTIC CLIFFS

SIR,—In his recent paper entitled “Atlantic Gulfs, Estuaries, and Cliffs” (*Geol. Mag.*, lxxxviii, 1951, pp. 113–128), Professor C. A. Cotton discusses my views on the bevelled cliffs of Cornwall (M. A. Arber, “Cliff Profiles of Devon and Cornwall,” *Geogr. Journ.*, cxiv, 1949, 191–7). He says (p. 125), “The upper part (since graded back to a much gentler slope by subaerial process) once, apparently, descended, steeply no doubt, to a raised beach of interglacial or interstadial age (M. A. Arber, 1949, p. 196). It has been reattacked and steepened (freshened) at the base since the last return of the sea. This is essentially the explanation adopted by Miss Arber (1949), though her recognition of a changeover from marine cliff-cutting to subaerial erosion during glacial-age marine regression is not explicitly stated.”

Professor Cotton goes on to say that Challinor (*Geol. Mag.*, lxxviii, 1931, 111–121; *Geography*, xxxiii, 1948, 27–31; *Geography*, xxxiv, 1949, 212–15), “on the other hand, explains the bevel or upper cliff quite differently.”

I wish to say that I have never held the view which Professor Cotton attributes to me (although he admits that I have never “explicitly stated” it); and that I agree with Mr. Challinor’s interpretation of a bevelled cliff: that the curve above is due to subaerial erosion proceeding *pari passu* with the marine erosion which cuts the vertical face below.

As I have tried to show in my paper on the cliff profiles, the distribution of bevelled cliffs in Cornwall is a consequence of the structure, especially jointing, of certain rocks. I believe, as I there suggested, that the wave-cut face, as well as the bevel above, was probably cut before the end of the Riss glacial period (or whatever date the raised beach was cut), and therefore I should not subscribe to a “hypothesis of two-cycle origin” such as Professor Cotton suggests for the present cliff profiles.

Professor Cotton (p. 126) also refers to the view expressed by E. A. N. Arber, Dewey, Macar, and myself, that the “truncation of the valleys of some small streams by cliff retreat . . . might be cited as proof of exceptionally rapid recession of the cliffs”. Professor Cotton then says that “such a theory is inconsistent with the fact of preservation at various places of a raised beach covered by head presumably of glacial age”. From my own observation, I can however say that where the valleys are most truncated and the coastal waterfalls highest, in the coast south of Hartland Point, there are (so far as I know) now no remains of the raised beach. That where the valleys are truncated, the raised beach (if it ever existed) has been destroyed, is further evidence of the rapidity of recession of the cliffs.

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## REVIEWS

RÉPUBLIQUE SYRIEN : CARTE GÉOLOGIQUE AU 50,000, FEUILLE DE ZEBDANI. (Damascus, Ministère des Travaux Publics, 1949.)

RÉPUBLIQUE LIBANAISE : CARTE GÉOLOGIQUE AU 50,000, FEUILLE DE DJEZZINE, 1950; FEUILLE DE RAYAK, 1950; CARTE GÉOLOGIQUE AU 200,000, FEUILLE DE TRIPOLI, 1949. (Beyrouth, Ministère des Travaux Publics.)  
By L. DUBERTRET.

The splendid geological maps of Syria and Lebanon on the 1 : 1,000,000 scale and of the Middle East on the 1 : 2,000,000 scale, by M. Dubertret, are well known. He and the two republics are to be congratulated on this series of new geological handbooks. Their size is right for the pocket, yet each contains a folding coloured geological sheet, from eight to twelve full-page photographs, a bibliography, and on the average sixty-three pages of text with many diagrams, sketch-maps, and sections. Each is an admirably clear, self-contained account of the stratigraphy (Jurassic to Pleistocene), geomorphology, and tectonics of the area and its broader setting. If two small criticisms are not ungracious, they are that one looks in vain for a statement of what other sheets have been published or are in preparation, and that all the stratigraphical tables are upside down. The Zebdani sheet covers part of the classic area of Mount Hermon and includes two pages of photographs of Palaeolithic implements.

W. J. A.