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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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."