

folded, sheared, and mylonized sediments. Along one of the major dislocations amphibolites were thrust over sediments along a front of more than 50 miles.

Associated with the thrusting was an influx of potash, silica, and minor constituents including boron, beryllium, lithium, fluorine, chlorine, phosphorus, and carbon dioxide. This metasomatism gave rise to profound changes in the amphibolites, transforming them to acidic potash-permeation augen gneisses. The material displaced from the amphibolites, largely iron and magnesia, was driven out into the sediments, producing, from mudstones and siltstones, a group of chlorite permeation schists which often contain as much as 90 per cent ripidolite. Micro-textures in these schists clearly show the replacement of the original sedimentary material by chlorite. Away from the thrust, the chlorite schists grade quite sharply into sediments which are unaltered except for quartz veining, silicification, and ferruginization, the iron and silica responsible for these phenomena being derived from original sedimentary material displaced by the influx of iron and magnesia.

The chlorite permeation rocks crop out not far from the major thrust mentioned above, forming an almost continuous basic front which has been traced for a distance of over 50 miles parallel to the thrust. It is significant that wherever amphibolites and sediments are involved, similar chlorite schists occur in association with the other major thrusts in Ukinga. In cases where granitic gneisses are thrust over sediments, however, the chlorite schists are completely absent or very poorly developed.

Although the potash metasomatism of Ukinga is not yet proved to be a precursor of granitization, I feel that further work in adjacent areas may show this to be the case. In this part of Tanganyika, therefore, the "exceptional and rare" conditions which, according to Joplin, are required for the production of a regional basic front, are fulfilled, the main factor being the juxtaposition of amphibolites and sediments over a distance exceeding 50 miles. It is hoped that further work to the south will enable this basic front to be traced for an even greater distance.

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#### SUPPOSED TUFA BANDS IN CARBONIFEROUS REEF LIMESTONE

SIR,—In a recent paper (*Geol. Mag.*, 1952, lxxxix, 195), Dr. W. W. Black concludes that certain fibrous bands in Carboniferous reef limestone hitherto regarded as primary tufa are in fact secondary crystallization structures in an original calcite mudstone. Dr. Black may well be right in his interpretation of the particular features that he describes in detail, but the varied structures to which the name "reef tufa" have been collectively applied are often not associated with calcite mudstone and some of them are obvious encrustations, whether recrystallized or not.

In a series of papers I have frequently referred to these structures but have never critically discussed their origin, and I have hitherto accepted in a broad way Tiddeman's explanation for the reason that neither I nor others working on reef limestone have found a better one. I have always suspected, however, that the bands are not all of similar origin and that the term "reef tufa" might be inapplicable to some of them.

As Dr. Black observes, the fibrous bands are about  $\frac{1}{4}$  in. thick, but this

tends towards a maximum and a single specimen might consist of many parallel or concentric layers varying in depth to less than  $\frac{1}{2}$  mm. This is particularly noticeable in those varieties that encrust fossils or that display contortions and other irregularities without obvious encrustation. As regards the extent of the "tufa" I have seen masses several square feet in area on weathered surfaces, and I have observed large colonies of fasciculate lithostrotionids with the corallites cemented together by radiating fibrous calcite in concentric layers and with dark blue-grey calcite mudstone as a final infilling between the encrusted corallites where these are not in actual contact. Such features seem to me to be original, but if any recrystallization has occurred it has been confined to the encrusting material, whether organic or inorganic: the calcite mud when present is unaffected. If such encrustations were organisms their nature has not been determined. In some cases, as Black points out, bryozoans are associated with the bands and certain of them may in fact be partly recrystallized bryozoa. In this respect it is interesting to note that Dr. Black finds no evidence in support of Dr. J. E. Prentice's statement (*Quart. Journ. Geol. Soc.*, 1951, cvi, 171) that the fibrous bands represent "in recrystallized state the layered skeletons of the reef-forming calcareous algae". In view of the many references to these structures, notably by Hudson, Bond, and Parkinson, it is rather curious that Prentice does not refer to the prevailing view of their origin.

I do not follow Black in his argument that the formation of tufa necessitates extensive uplifts, since in reef sedimentation much of the growth is near sea level. (See also Bond, *Quart. Journ. Geol. Soc.*, 1950, cv, 157, and *Geol. Mag.*, 1950, lxxxvii, 267.)

Dr. Black's strongest evidence for the secondary nature of the layers is his discovery of fossils partly in calcite mudstone and partly in the fibrous material, which brings me back to my original point of the possible mixed origin of the bands. But whatever the truth of the matter the structures have one thing in common; they occur only in deposits to which the name reef limestone has been applied. This indicates that the layers are indicative of something inherent in the mode of accumulation of the sediments.

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#### FOSSILIFEROUS STRATA AT KAPP SCANIA, DAUDMANNSØYRA, VEST SPITSBERGEN

SIR,—During the Birmingham University Expedition to Spitsbergen, 1948 (leader M. F. W. Holland), which was engaged in the geological survey of the southern part of Oscar II Land, B. H. Baker collected some fossils, mainly corals, at Kapp Scania. This locality lies well within a belt extending along the west coast of Spitsbergen which has long been known to consist of practically unfossiliferous folded rocks referred to the Hecla Hoek system of Pre-Devonian age. (A. K. Orvin, *Skrifter om Svalbard og Ishavet* No. 78, 1940.)

Last year a second collection was made from the same area by a party (including Holland) from the Oxford and Cambridge Spitsbergen Expedition, 1951.

Both collections have now been examined at Cambridge by one of us (C. L. Forbes) and the corals are found to belong to *Caninia calophylloides* (Holtedah) and related species, while the brachiopods present are probably *Choristites* sp. (the specimens are of poor quality). There are also a few fusulinids, completely silicified, but showing traces of deeply folded septa. The fauna seems to be of high Middle or low Upper Carboniferous age. A comparison of this fauna is being made with the extensive collection of the Cambridge Spitsbergen Expedition, 1949, from the Billefjorden region at present being examined (by C. L. Forbes).