

clays, given as 4-7, is also wrong. It is not true that sepiolite is the end-member of the magnesium-for-aluminium substitution series in attapulgite, or that less than 10%  $\text{Fe}_2\text{O}_3$  in a clay is indicative of beidellite, or that the water removed by water solvents from acid-activated clays is considerably in excess of that removed by simple drying. Some readers may even object to seeing the location of an occurrence of palygorskite given as Shetland Isles (England), but, of course, this is a very small error when viewed from distant India. Rather more serious is the confusion existing on some of the theoretical points. The most conspicuous example is an account on p. 34 of the various types of surface held responsible for the bleaching action of montmorillonite and of the supposed effect of acid-activation, which is said to produce flat silicate sheets and thus give an extended surface useful in adsorption. Anybody who has compared natural and acid-activated clays by electron microscopy can prove that there are far fewer flat silicate sheets in the acid-treated product.

All these criticisms are perhaps of little importance for the practical reader who wants to get general information quickly on a new subject. For such a purpose, the book is adequate, since the errors found are more on the academic than on the practical aspects of the subject.

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EDMONDS (E. A.), WRIGHT (J. E.), BEER (K. E.), HAWKES (J. R.), WILLIAMS (M.), FRESHNEY (E. C.), and FENNING (P. J.). *Geology of the country around Okehampton (Explanation of one-inch geological sheet 324, new series)*. Inst. Geol. Sci., Mem. Geol. Surv. Gt. Britain, 1968, xii+256 pp., 20 figs., 22 pls. (8 in colour). Price 40s.

This area is dominated by the northern portion of the Dartmoor Granite, which has been intruded into an area of intensely folded and faulted Carboniferous chert, shale, and sandstone to produce a metamorphic aureole up to 2 km wide. The nature of the Dartmoor Granite, and in particular the implications of the presence of secondary potassium feldspar and quartz, are critically discussed. No new chemical analyses are presented and the sequence of events postulated by Dr. Hawkes is based mainly on textural evidence, taken together with theoretical considerations. The Dartmoor magma is considered to have behaved as two distinct phases: a silicate melt of trondjemitic composition, and an aqueous fluid bearing appreciable quantities of K and Si with less amounts of Al, Li, Be, B, F, Fe, and Sn. The crystallization of the melt gave a plagioclase-quartz-biotite crystal mush, containing only a minor amount of interstitial potassium feldspar; it is considered that the associated aqueous phase remained largely passive at this stage but that once the temperature had declined sufficiently ionic exchange took place between the K in the fluid and the Na in the plagioclase, causing the replacement of plagioclase by orthoclase perthite. As crystallization proceeded the arrival of more aqueous fluid of similar composition gave rise to the late-stage albite-rich aplites, the largest of these being the Meldon Aplite, which crystallized outside the granite with a suite of lithium minerals and numerous rare accessory minerals. Further aqueous fluid is thought to have reached the outer parts of the pluton after the formation of the aplites, this fluid being more depleted in alkalis

but producing hydrothermal changes, and still later the arrival of boron-bearing fluid caused the widespread growth of tourmaline. It is suggested that the adamellitic rocks comprising the visible part of the Dartmoor pluton probably pass into dominantly granodioritic and tonalitic types at a relatively shallow depth.

Widespread disseminated mineralization occurs in the area; the authors of the memoir distinguish a pyrometasomatic mineralization of Culm rocks within the aureole from later hydrothermal veins both in the granite and the surrounding country rocks for up to 8 km from the contact. The metamorphic rocks of the aureole including the calc-flintas and calc-silicate hornfelses are described in detail and mention is also made of the somewhat altered lamprophyres and Permian lavas of the district. There is a separate chapter on geophysical investigations. The introduction gives a fascinating commentary on the moorland scene, and we are also told that at Chagford, a Stannary Town, in the early days a miner selling tin judged to be impure had some of the molten metal poured down his throat. The references are usefully collected together at the end of the memoir and the sixteen colour photographs do much to illustrate the nature of the area.

The Okehampton district was described by De la Beche in the very first memoir of the Geological Survey; it is good to have a modern petrological account of this classic area.

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