constituents in the natural system modifying, as it were, the less complex experimental system, and as this "natural ternary minimum" will vary areally depending on the fluxes present at any given point, the term "natural ternary minimum field" is considered more appropriate[3] This field defines the composition of initial melts generated selectively during palingenesis[1,6,7].

Available data from the Land's End granites (Fig. 1) illustrate the existence of two fields of relatively sodium-rich terms, one including the early granites (marginal granite field) and one including aplites and leucogranites (aplite field), thus supporting the findings of Brammall and Harwood[8] and Exley and Stone[6]. The data delineate a large "main granite field", and furthermore, demonstrate several evolutionary trends. The sodium-rich chilled marginal granites[5] could also represent a natural ternary minimum field and reflect the trend in composition of the invading magma, but since these and the main porphyritic granites have been subjected to potassium metasomatism[3,9] it seems more probable that the "marginal granite field" initially lay closer to the experimental trend, and was subsequently diverted towards the orthoclase apex on metasomatism. Loss of potassium from the centre of the granite would have left it relatively enriched in sodium, thus providing the basis for further differentiation. This, together with filter pressing, produced aplites and leucogranites which ascended through fractures in the main granite which was by now essentially solid. In several marginally "weak" areas along the north-west coastline at Land's End, the inner sodium-rich granite broke through the coarse porphyritic envelope in a similar manner to the St. Austell mass[10].

It is suggested that some deep seated granite, granodiorite or granite gneiss, underwent differential anatexis[7], to produce a "milieu mobilisé" the composition of which would lie within the "natural ternary minimum field" and that this quartzo-feldspathic liquid ascended through the overlying sediments in much the same manner as other south-western granites[6] (that is, by forceful injection with overhead stoping, and assimilation).

Evidence therefore suggests that the Land's End granites progressed from a sodium-rich magma to a potassium-rich granite by endometasomatism, coevally evolving a sodium-rich core and aplitic "fluids" by differentiation. This produced a series of granites which represent most petrogenetic trends encountered in the south-western pluton, and which are consistent with its regional development.

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Igneous Intrusions and Associated Rocks of the Mangerite–Charnockite Suite

THE demonstration that the pattern of rare earth abundance in a quartz-monzonite from Grenville Township, Quebec, is typical of the pattern shown by most sedimentary rocks[1] is of considerable interest in view of the controversy concerning the consanguinity of anorthosites with mangerites and kindred rocks of the charnockite suite.

This rare earth pattern is consistent with a metamorphic or ultrametamorphic origin for the charnockitic rocks, and supports the proposals of Hargraves[2] and Berrangé[3], who have contended that charnockites bordering major Canadian anorthosites are derived from the country rock gneisses.

The Precambrian rocks of the Kap Farvel district in South Greenland (which we are investigating on behalf of the Geological Survey of Greenland[4]) include charnockites with some similarities to those described from Grenville Township. The charnockites partially surround a late plutonic suite of norites, monzonites and rapakivi granites emplaced approximately 1650×10^6 yr ago. The igneous rocks clearly intrude the charnockites and may develop an iron-rich border facies against them; however, charnockitic veins also penetrate the igneous suite. A late potash metasomatism, with the potash apparently derived from the country rock, partially obliterates primary features in the border facies.

The charnockites near to the contact with intrusive igneous rocks have extremely complex and apparently chaotic structures but microscopically show equilibrium textures indicative of annealing recrystallization in a static environment. They contain orthopyroxene with abundant clinopyroxene lamellae and felspars with carlsbad/albite twinning thought by Philpotts *et al.*[1] to be typical of that found in igneous rocks. Away from the contact the charnockites grade structurally, texturally and mineralogically into the surrounding semipelitic and granitic gneisses, which have a relatively simple overall structure and amphibolite facies mineralogy. The field relationships strongly suggest that the charnockites were formed by granulite facies metamorphism and ultrametamorphism of the country rock gneisses. This suggestion is supported by the behaviour of basic intercalations in the gneisses which, as the igneous contact is approached, retain their original directional fabrics but are disrupted by the enclosing charnockitic acid gneiss. Close to the contact of the intrusive igneous rocks the basic fragments are mantled by fine grained pyroxene-rich rock with an equilibrium texture which encloses centres retaining amphibolite facies mineral assemblages and directional fabrics.

Although the charnockitic rocks of the Kap Farvel area are in part igneous, in so far as some appear to have crystallized from locally derived anatectic melts, we believe that—in common with those described by Hargraves and Berrangé—they represent contact metamorphic products better suited to classification and description in terms of mineral facies, rather than in terms of igneous nomenclature which places emphasis on compositional differences. According to this view these charnockites can be regarded neither as having been generated independently of their associated igneous suites[1,5], nor as being comagmatic with them[6,7].

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