inches long) ; in particular the olivines in dunites are usually very irregular in shape. In the lower part of the Upper Zone many rocks show only relict protoclastic texture and the grains have long apophyses penetrating along crystal boundaries.

Recrystallisation of Rocks of the Red Hills Complex

Original protoclastic texture has been modified and in some cases entirely obliterated by post-deformational recrystallisation. The first stage in the process is shown in the development of irregular apophyses at the margins of porphyroclasts in the protoclastic harzburgites of the Basal Zone. These apophyses, surrounded by the matrix, are unlikely to persist during protoclasis and have probably grown by post-deformational recrystallisation, the larger grains assimilating the smaller, relatively unstable, grains of the matrix. As assimilation continued the larger grains began to interfere and develop smooth crystal boundaries (Pl. 2, Fig. 2). Remnants of the matrix of the original protoclastic texture may still be observed between the larger grains.

The final stage of the process is complete obliteration of protoclastic texture and the consequent development of xenomorphic-granular texture. Highly irregular grains such as those of Pl. 3, Fig. 1, can be readily explained by this process. Late in the recrystallisation process some grains assimilating the interstitial finely granulated material were constrained by adjacent porphyroclasts and the grains developed long apophyses penetrating along crystal boundaries with growth only completed when all the matrix had been absorbed.

Ragan (1963) has cited several examples of recrystallisation in the Twin Sisters Dunite—such as a thin unstrained mosaic zone cutting a single strained crystal. Similar features occur throughout the Red Hill Complex. In one specimen a train of small grains of spinel crosses a large orthopyroxene grain and adjacent grains of olivine. The orthopyroxene and olivine evidently grew *in situ* surrounding and partly assimilating the spinel, which had been granulated during earlier protoclasis.

Poikilitic or poikiloblastic orthopyroxene enclosing grains of olivine (Pl. 3, Fig. 2) are of common occurrence. In general the enclosed grains are wholly anhedral, though a few grains may show possible crystal faces. The enclosed grains are smaller and commonly more rounded than the olivine grains that make up the remainder of the rock. Such poikilitic grains may be interpreted as formed by replacement of olivine by orthopyroxene, growth of an orthopyroxene porphyroclast surrounding olivine grains of an initially protoclastic matrix, or, by analogy with the poikilitic harzburgites of the Stillwater Complex (Challis, 1965a), as indicating crystal sedimentation from a magma. The writer considers that many such grains were formed by replacement or recrystallisation in the solid state, and regards them as poikiloblastic rather than poikilitic.

Rock Structure

Lineation, defined by parallel orientation of elongate minerals or mineral aggregates, is not common in the Red Hill Complex and is only readily observed in the lowest rocks of the Upper Zone. The individual orthopyroxene grains show strongly preferred orientation with their c-axes parallel to lineation. Microscopically, well developed lamellae parallel to (100) can be observed (10967), and usually the grains are strongly cleaved on (210). The lamellae are distinct from exsolution lamellae in that they are much more numerous, finer, and closely spaced, and are probably translation lamellae (Turner and Weiss, 1963: 359). The texture of the rock is protoclastic with only minor recrystallisation, and evidently the lineation is a deformational feature. Fabric studies show that the rock also has a strongly developed preferred orientation of olivine, and Z (= (100)) olivine is parallel to the lineation.