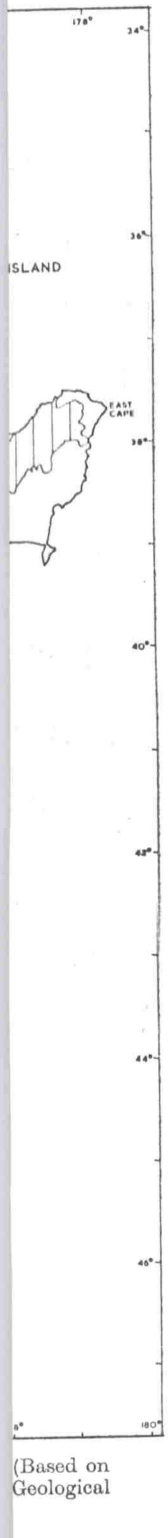

(Based on
Geological

of the Jurassic beds is commonly about 10,000 ft. Petrographically, the Lower and Middle Mesozoic rocks of the Southland Syncline consist almost entirely of volcanic greywackes, siltstones and tuffs with scattered lenses of conglomerate. They belong to the "Hokonui Facies" of WELLMAN (1952), which is also preserved near Nelson and in the coastal regions of the south-west part of Auckland province.

On the north flank of the Otago Schists (MACKIE, 1936), as on the east of the Alpine Schists (WELLMAN, GRINDLEY and MUNDEN, 1952), are semi-schists that locally contain Triassic fossils, followed by an extensive belt of "greywacke" of WELLMAN's "Alpine Facies,"* largely Mesozoic in age, but including elements containing the Permian fossil *Atomodesma* sp. in South Canterbury. This belt forms the main mountain ranges of Canterbury and Marlborough, and reappears to the north as the basement of much of the North Island. Thicknesses are largely unknown, although WELLMAN *et al.* (1952) consider that for part of the Triassic at least they are greater than in the Hokonui Facies. Graded, greywacke-type sandstones and siltstones are dominant. The volcanogenic fraction is less conspicuous than in the Hokonui Facies, and detrital quartz, potash feldspar and muscovite are correspondingly more abundant. Occasional interbedded volcanics are mostly spilitic pillow lavas, in contrast to tuffs of andesite–dacite–rhyolite affinities and rare andesitic intrusions which occur in the Hokonui Facies.

The concept has grown among New Zealand geologists of a progressive metamorphism consequent upon increasing depth of burial, depth being held to be the main factor controlling temperature. The absence of major intrusives in the New Zealand Geosyncline and, at least in the case of rocks of the zeolite facies, the sequence of mineralogical changes are both compatible with this view. At least three factors may modify this simple conception. First, the geothermal gradient may have varied in different parts of the geosyncline, the gradient being likely to have been lowest where sedimentation was thickest and most rapid. Secondly, structural evidence (GUNN, 1956; LILLIE *et al.*, 1957; ROBINSON, 1958) indicates the possibility that in the higher grade rocks important folding preceded the metamorphic maximum. Thirdly, it is conceivable that internal deformation, which in the schists is often intense, may have affected the position of mineralogically-determined isograds by promoting reactions or by causing slight rises in temperature.

Opinions differ as to the date of the "main" metamorphism and as to whether sedimentation was essentially continuous in the axial regions of the geosyncline. MUTCH (1957) and WELLMAN (1956) have suggested that there is a continuous thickening of formations from the Southland Syncline towards the Otago schist axis, and consider that the maximum grade of metamorphism was attained in the axial region of the geosyncline where these and Lower Jurassic formations were assumed to have achieved their greatest thickness. If this is so, there is a continuous gradation from the zeolite facies through a broad transitional belt into the greenschist and higher grade facies. In two columns, MUTCH indicates 50,000 and 95,000 ft of pre-Jurassic cover for the schists down to the Chl.2 subzone. Evidence of metamorphic grade in the Otama and Kaka Point areas does not altogether

* Named from the Southern Alps of New Zealand.