The first stage corresponds in part at least to the zeolite facies of Southland, zeolites being rare largely on account of the scarcity of suitable reacting materials. It is also conceivable that sedimentation was more rapid and the geothermal gradient even less steep in the Alpine Facies than in the Hokonui Facies. This could have caused water to have been expelled and porosity lost by compaction before zeolites could form at an appreciable rate. Stage 2 corresponds directly to the prehnite–pumpellyite stage as defined for Taringatura although osmotic or water-deficient conditions could conceivably cause the formation of prehnite at lower temperatures than in Taringatura (see 4.5, 4.10). The appearance of plentiful vein quartz in stage 3 (zone of quartz–prehnite veins) may well indicate a higher temperature and is not readily compatible with any suggestion of water-deficient conditions. WELLMAN *et al.* (1952) have stressed the importance of "quartz" veins as a metamorphic indicator in New Zealand, and although this is a criterion to be used with great caution, the veins being promoted by shattering or the opening of tension fractures, the abundant incoming of quartz-bearing veins is here accepted as being of potential metamorphic significance, as further discussed on theoretical grounds in a later section.

The sequence of vein fillings noted in stage 4 is a reversal of the trend recorded for progressive metamorphism under increasing load and temperature although with stilbite taking the place of heulandite, and it can be correlated with the filling of fractures under conditions of progressively decreasing load and temperature during denudation. Laumontite in minor faults in chlorite-zone schists at Five Mile Creek, and in joints in greenschists near Shotover Bridge, both near Queenstown, Central Otago, has a similar retrogressive significance. Apart from the possible effects of differing rock pressure and vein-water pressure as discussed later, and in the absence of the incoming of newly heated solutions, the metamorphic significance of a late zeolite- or prehnite-bearing vein is that the rock it cuts has passed through a metamorphic maximum with P–T conditions at least as severe as those of which the vein mineral assemblage is diagnostic.

2.5. *Later Mesozoic geosynclinal sediments*

Analcime and heulandite in Lower Cretaceous greywackes, in part tuffaceous, collected by D. HAMILTON from the Hurunui Gorge above Ethelton in North Canterbury, veinlets with laumontite and calcite and laumontite replacement of plagioclase in the Cretaceous Taitai sandstone from Motu Falls, Poverty Bay, show that zeolitic alteration also occurs in thick sedimentary sequences of New Zealand younger than those of the main New Zealand Geosyncline.

2.6. *A prehnite–pumpellyite zone*

The above descriptions show that prehnite-bearing rocks are of regional extent in New Zealand. They appear to grade continuously into chlorite-zone schists, and prehnite-bearing assemblages are also found in the more altered members of the zeolite facies. TURNER and HUTTON (see TURNER, 1948, p. 38) have divided the "chlorite zone" of metamorphism in Southern New Zealand into four *texturally* defined subzones, these being progressively more reconstituted from subzone Chl. 1 to Chl. 4. ROBINSON (1958) shows that pumpellyite occurs freely in semischists of subzones Chl. 1 and 2 on the east Otago coast south of Brighton, but