estimated by MARWICK (1946) to be 28,000 ft thick. Several hundred thin beds of vitric tuff altered to impure laumontite rock are exposed along the coast. Plagioclase is in part replaced by laumontite and in part is either albitized with sericite inclusions or remains as relict oligoclase or andesine. Subordinate spongy prehnite is not uncommon in laumontitized vitric tuffs, in the groundmass of crystal tuffs and volcanic greywackes, and in tuffaceous siltstones. Calcite–laumontite veins are a feature of crush zones, especially along the bedding planes. Biotite tends to be chloritized, and secondary quartz, calcite, chlorite and sphene occur. Rocks in the heulandite stage were noted but appear to be rare.

2.3. *The Otama Igneous Complex and associated Permian sediments*

2.3.1. *Geological setting.* Four miles north-eastwards across the strike from the lowest Triassic beds of the Hokonui Hills, is the Late Paleozoic Otama Intrusive Complex of which about 16 square miles are exposed. It consists dominantly of metagabbros and albite micro-granites, associated with keratophyric and spilitic volcanics, some of which are hornfelsed by the intrusives. Although individual members are not all stratiform in arrangement the mass is roughly concordant with the enclosing sediments and is interpreted by WOOD as having been overturned through an angle of 110°. On its north side, the complex is in steeply dipping thrust-contact with prehnite-bearing greywackes which, as far as is known, grade northwards through progressively more metamorphosed rocks of the Tuapeka Group into the typical schists of Central Otago type.

Permian volcanic greywackes and associated dacitic tuffs immediately south of the complex are partly in the heulandite stage of alteration and partly in the laumontite stage, and it was from this area that HUTTON (1949b) first drew attention to the metamorphic significance of laumontite.

2.3.2. *Alteration of the Otama Complex.* At least two types of alteration are represented: contact metamorphic effects produced during the emplacement of successively younger intrusions; and subsequent low-grade alteration of a more regional nature that has affected the igneous complex and sedimentary rocks alike. For example the conversion of keratophyres into plagioclase–hornblende–epidote and plagioclase–hornblende–diopside hornfelses belongs to the first type; albitization of the plagioclase and veining of the same rocks with prehnite and sometimes laumontite belongs to the second type. The later alteration has undoubtedly been promoted by intense crushing almost throughout the complex. This has allowed free access to a vast surface-area of rock, of the water essential for the formation of those minerals diagnostic of zeolite facies conditions, and without which a high-temperature igneous mineral assemblage will be preserved at low temperatures virtually throughout geological time. In both the basic and more acidic rocks calciferous plagioclase is something of a rarity, its place being taken by cloudy albite and/or a variety of other secondary minerals including epidote, pumpellyite, prehnite, laumontite, thomsonite and analcime. Crush-zone laumontite associated with prehnite has already been described (COOMBS, 1952).

The more basic rocks are of particular interest in showing the effects of zeolite facies metamorphism in an environment devoid of free silica. The most typical Ca–Al–silicate in these rocks is thomsonite.

An unusually fresh, basic noritic gabbro, no. 946, from 125 chains NE of Otama Hall, consists of bytownite An_{83}, augite and hypersthene sometimes mantled with hornblende, minor