

west traversed by the main road. The most important observations made relate to the raised beaches near the coast-line, to some beds, mainly conglomerate, of Upper Tertiary age, and to an unconformity above the Amuri limestone similar to that already described as occurring in the neighbourhood of Kaikoura. The general geology of the localities now under consideration is practically the same as that of the Kaikoura district.

#### *Raised Beaches.*

Evidence of considerable elevation in Pleistocene and Recent time is very easily observed almost everywhere along the Marlborough coast. At the mouths of the Oaro Stream and the Conway River and elsewhere raised beaches representing the last uplift of the land occur only a few feet above sea-level. Very fine fluvio-marine terraces, with tops approximately 40 ft., 50 ft., and 200 ft. above the sea, also distinguish the mouth of the Conway. Northward near Claverly homestead the 200 ft. terrace is clearly observable, whilst the almost flat tops of Amuri South and Amuri Bluffs also indicate marine erosion at approximately the same contour. West of Claverly homestead a well-marked terrace appears at approximately 400 ft. elevation, and again almost on the top of the hills overlooking the coast are outcrops of beach shingle and sand at a height roughly estimated at nearly 600 ft.\* McKay gives the height of the highest terrace gravel as seen on Amuri Bluff Hill as 500 ft., and mentions that it is there fossiliferous (6, pp. 177-78; 11, p. 127; 16, p. 182). Hutton mentions the terraces and sea-cut platforms of this district in his earliest report (4, p. 55). Recently J. A. Thomson reports fossiliferous sandy beds in the valley of Oaro Stream at an elevation of 900 ft. (22, p. 8). Since, however, the contained fossils indicate a Pleistocene age, it is likely that the beds in question belong to an earlier period than the series of raised beaches here described, and, in fact, there is room for a suspicion that they form part of the Upper Tertiary beds now to be described.

#### *Upper Tertiary Beds ("Great Marlborough Conglomerate").*

On or near the road from Te Oaro to the Conway River numerous outcrops of a conglomerate post-dating the Grey Marl may be observed. This rock, together with some associated fine-grained beds, may without much hesitation be correlated with McKay's "Great Post-Miocene Conglomerate," called by Thomson and Cotton the "Great Marlborough Conglomerate," a non-committal name that will be adopted in this report.

The first outcrop to be noted is not far south of Te Oaro School, where on the east side of the road is steeply dipping conglomerate composed of medium gravel intermingled with large masses of various kinds of rock, including Grey Marl. This conglomerate rests on a fault-plane, below which is a hard calcareous mudstone, presumably the Grey Marl. It is noteworthy that the fault follows a bedding-plane of the latter rock, and hence there is an appearance of conformity between the Grey Marl and the conglomerate.

Southward from the saddle leading into Okarahia Stream conglomerate outcrops in the road-cuttings for a considerable distance. The rock consists of bands of medium greywacke conglomerate, interbedded with layers of bluish claystone, but here and there exhibits its characteristic feature, a liberal admixture of great angular boulders of greywacke, Amuri limestone, and Grey Marl many feet in diameter. Not far from the point where the road crosses Okarahia Stream the conglomerate is abruptly terminated against crushed greywacke by a strong reversed fault.

The next appearance of the Upper Tertiary rocks is near the saddle south of Hundalee Post-office (Norrie's), where the road-cuttings expose outcrops of conglomerate and claystone, more or less intermingled by faulting movements. The conglomerate, which contains a number of marine fossils, consists mainly of small pebbles of greywacke, with some Amuri limestone, flint, &c. South of the saddle and for some distance towards the Conway River there are good exposures of conglomerate interbedded with blue claystone, which was not observed to be fossiliferous or calcareous. In places the conglomerate is composed only of small or medium-sized pebbles in a matrix of finer material, whilst elsewhere it contains huge angular blocks of greywacke and bluish claystone (presumably Grey Marl). At one point on the roadside conglomerate appears to rest unconformably on bluish claystone (? Grey Marl).

Everywhere from Te Oaro to the Conway River the Great Marlborough Conglomerate is more or less fault-involved, and exhibits strong dips, all in a westerly direction so far as the writer's recollection serves.

*Relation of Conglomerate to Grey Marl.*—C. A. Cotton has not merely cast suspicion upon the supposed unconformable relation of the Great Marlborough Conglomerate to the Grey Marl, an unconformity which was never doubted by McKay, but has maintained that in the Clarence Valley the opposite relation holds good (25, pp. 350 *et seq.*). A consideration of the data afforded by the outcrops of the conglomerate between Te Oaro and the Conway River, together with those obtained in the Cape Campbell district, leaves no doubt in the writer's mind as to the existence of unconformity between the two rocks. A passing glimpse of the coastal outcrops near Keke-rangu gives a similar impression. Thus the coastal region, which, however, was expressly excepted by Cotton from the scope of his paper, apparently lends no support to that author's views.

When one considers the inherent probability of a conglomerate containing numerous boulders derived from underlying strata being unconformable to those strata, when McKay's powerful testimony is given due weight, and when the similarity of all the occurrences is taken into account, Cotton's hypothesis of conformity in the Clarence Valley, with its various corollaries, fails to carry conviction. It may be suggested that the apparent continuity observed by Cotton

\* All terrace heights mentioned in this report were estimated by means of the eye only.