

The depression that had brought the sea over the Miocene land continued, and off-shore deposits consisting of rapidly alternating layers of sandstone and claystone were laid down. In these the sandstone-beds contain a considerable proportion of mud, indicating that the conditions of deposition were unfavourable to the perfect classification of the detritus.

The next set of beds, consisting of structureless claystone with rare sandy partings, proves the further progressive sinking of the land and adjacent sea-floor. These beds contain many Foraminifera and Echinodermata, but molluscs are very rare. Often the calcareous content has become concentrated in large concretionary boulders, of which the disposition may or may not follow the lines of stratification. In Waikohu Survey District the claystone must be of very great thickness, but towards the coast is decidedly less prominent.

The next succeeding beds are pre-eminently shallow-water deposits consisting of ripple-marked sandstone layers in rapid alternation with claystone. Sometimes irregular layers of ironsand occur; and it is from them that the blacksand of the present sea-beaches has been in great part derived. Near the upper portion of these beds layers of white pumiceous sandstone and claystone occur. No flow or dyke rocks of this type are known *in situ* nearer than the Rotorua district, and it is tempting to consider that the same crustal stress as that which caused igneous activity there manifested itself in the Gisborne district by an elevation of the land.

This uplift is considered to mark the end of the Miocene. The next succeeding beds—the Ormond beds—consist of hard blue fossiliferous sandstone, which is best seen at the head of Manakaha Creek, in the Waimata Valley, and along the course of the Waihirere above the oil-bore. A well-marked unconformity between the Miocene and Pliocene was observed in the Waihora valley about a mile from Te Karaka, and again near Waerenga-o-kuri; but generally there is a concordant transition from one series into the other.

The upward succession of the Ormond beds is as follows: (1) A coarse brown fossiliferous sandstone, which in Manakaha Creek reaches a thickness of 200 ft.; (2) a sandy limestone with brachiopods and numerous pectens; (3) soft sandstone and pumice beds.

In the Waipaoa valley and the low lands about Poverty Bay are high-level terraces, which consist of fine gravel, sand, and pumiceous deposits, with occasional beds of lignite and peat. These constitute the Waipaoa Series of Adams.

Economic Geology.

Indications of oil, such as salt-water springs, occasionally accompanied by inflammable-gas emanations and rarely by traces of oil, are abundant. The geological structure is very complicated. The writers incline to the opinion that wide fracture-zones traverse the subdivision in a general east-north-east direction, and it is along these that the oil-indications are always found. The alternative explanation, that the region has been strongly folded and that the anticlinal crests have been fractured, presents many difficulties.

Another matter not yet settled is that determining the formation in which the oil originated. This is probably in the Cretaceous sequence; and if such be the case, unless the structural conformity of the Miocene and Cretaceous can be established, the choosing of bore-sites becomes a matter of difficulty.

Stone for macadamizing purposes is scarce in the subdivision, and what does exist is in general of poor quality. The best is that furnished by the limestones of the Ormond beds; but the green sandstone near the base of the Miocene is free from clay, and may be expected to form a fair road, provided the traffic be not too heavy.

MR. W. GIBSON, ASSISTANT GEOLOGIST.

Mr. W. Gibson, B.E., Assistant Geologist, began a detailed survey of the Egmont Subdivision, Taranaki, in September, 1914, and continued in the field until the end of the season. He also made an examination of the deposits of ironsand in the vicinity of Patea. The possibilities of these sands for the production of iron are described in a special report (No. 14) on a later page. Mr. Gibson furnishes the following *résumé* of the field-work in the Egmont Subdivision during the past season:—

EGMONT SUBDIVISION.

During the season just completed, detailed surveys of the greater portions of the Ngatimaru and Egmont survey districts were made. Assistance in field-work was given for brief periods by Messrs. M. Ongley, M.A., Assistant Geologist, and Mr. H. S. Whitehorn, Assistant Topographer. Mr. F. K. Broadgate, M.Sc., was attached to the party for four months as chainman and field assistant, whilst Mr. L. Grange, of the Otago University School of Mines, performed similar duties for an equal period. The season, with the exception of parts of November, December, and May, was suitable for field-work, and thus we were able to complete the mapping of almost the whole of the two survey districts mentioned above. The remaining portions, together with the intervening Huiroa Survey District and the small survey districts of Cape and Wairau, will, it is anticipated, be readily completed in a second season.

I. Ngatimaru Survey District.

Physiographic Features.

The surface of Ngatimaru Survey District is formed by a succession of alternating ridges and valleys, the latter containing here and there relatively small river-flats. The more important ridges for the most part trend from north-east to south-west, though branches with other directions are not uncommon. Their tops are fairly uniform in level, and rarely exceed 1,300 ft. in height. The longest ridge, to which may be given the name of Te Wera Ridge, runs diagonally through the centre of the survey district, and forms its main watershed, from one side of which streams supplying the Patea River flow in a south-easterly direction, whilst those on the other side go to swell the Waitara River, which enters the North Taranaki Bight.