

course rises and falls, down into valleys and up over hills, though in general there may be said to be a gradual descent from Maungapohatu eastward. The principal streams traversed after leaving Maungapohatu were the Anini, Hangaroa, and Wharekopae.

Physiography.—The part of the Urewera country through which we passed is deeply dissected by numerous streams, chiefly the tributaries of the Whirinaki, Whakatane, Ruakituri, and Hangaroa streams. The hills are rounded, subdued forms, well covered with creeping waste of local origin or with extraneous volcanic dust, and seldom showing very pronounced rock ledges. The pronounced cliff of Maungapohatu, at the northern end of the Huiarau Range, forms an exception. Along the various streams are narrow flats, and in a few localities, as in the neighbourhood of the settlements of Ruatahuna and Maungapohatu, these are fairly extensive, rising in broad terraces from the Mimiha and Mahakirua streams respectively, both tributaries of the Whakatane.

Nearly all of the Urewera country traversed is bush-clad, and only at the few Maori pas are there any clearings. The large rimu-trees are of great value as milling-timber. The soil improves in quality towards the eastern part of the area, being less volcanic than nearer Galatea. The gently flowing streams, the deep valleys, and the rolling forest-clad hills lend great charm to the soft picturesque scenery of the Urewera country.

General Geology.—The geology of the area is simple. Argillites and grauwackes, of uncertain but probably of Triassic or Jurassic age, are the prevailing rocks almost as far as Maungapohatu, whence later rocks continue to the eastward. These later strata are probably Early or Middle Tertiary and are most likely Miocene, though some of them have been described as Cretaceous. Patches of these later rocks occur to the westward of Maungapohatu, between Rua's pa and Ruatahuna.

The argillites and grauwackes are intensely corrugated. Their outcrop is often exceedingly rusty owing to the oxidation of contained iron-pyrites. In places calciferous zones occur in the argillites, and these are occasionally pyritous. The brecciation of the grauwackes interstratified with narrow argillite layers has in places produced a pseudo-conglomerate. Quartz is exceedingly rare.

The later and supposedly Tertiary rocks consist of claystones, sandstones, and impure arenaceous and argillaceous limestones. It is said by the Maoris that coal has been found in these strata at Maungapohatu.

The soft tuffs, which form thick beds near Galatea, gradually become thinner in passing eastward, but they occur in small patches almost as far as the Hangaroa River.

DETAILED WORK IN POVERTY BAY OILFIELDS.

Altogether some six weeks were passed in the Poverty Bay oilfields. Our systematic geological operations in this locality are confined to an area in the Raukumara Division, containing the survey districts of Waingaromia and Mangatu, and called the Whatatutu Subdivision. Prior to my arrival operations had been carried on for two months in this area by Mr. J. H. Adams, Assistant Geologist, whose co-operation I had during my sojourn in the subdivision. In former years geological surveys have been conducted in this locality by the late Sir James Hector, by Mr. Alexander McKay, and by Mr. H. A. Gordon. As Mr. Adams is submitting a somewhat lengthy preliminary report on the locality, it will be unnecessary for me to elaborate his description of the general geology and geography. Suffice it to say that the rocks exhibit a series of glauconitic sandstones, claystones, conglomerates (rare), argillaceous sandstones, and arenaceous limestones, which are crumpled into open but very irregular and broken folds, and are in many places faulted.

The country is deeply incised by numerous streams—the Waipaoa, Mangatu, and Waingaromia rivers and their tributaries. The larger rivers flow at grade, and are bordered by wide and fertile flood plains. The hills, which show no very conspicuous altitudes (the highest in the Whatatutu Subdivision being Arakihi, 2,302 ft.), represent a subdued topography, and are completely cloaked with waste derived from the decay of local strata, a feature which greatly enhances the value of the area from an agricultural standpoint. Outcrops of solid rock are very rare, excepting along the watercourses, but the country being almost entirely free from bush is well exposed for geological investigation.

Geologically, economic interest centres around the occurrence in the area of oil and gas springs, especially in the neighbourhood of Waitangi Hill. In order to indicate areas in which petroleum may be expected to occur geological work must be done with the utmost detail and care, and outcrops of solid strata must be most accurately located on a plan. Consequently, the work is of necessity slow and tedious, and our operations up to the present have been confined mainly to an area within a radius of six miles from Waitangi Hill.

In examining a petroleum-bearing country the theoretical questions to be considered are,—

- (1.) The surface indications of petroleum in the presence of petroleum-springs, gas-springs, &c.
- (2.) The presence or absence of a porous stratum of such material as sandstone or limestone, which might act as a storehouse or reservoir for petroleum.
- (3.) The presence or absence of an impervious stratum such as a bed of shale or claystone disposed above the porous stratum to serve as a barrier to the upward movement of the petroleum.
- (4.) The structure of the country, in order to locate the upward folds or anticlines.

If interstratified porous and impervious strata are folded into anticlines and synclines with the impervious beds above the porous, it is natural to expect that when water is present such petroleum and gas as may be formed by natural distillation beneath the surface will be collected in anticlines in the porous layers beneath the impervious beds, for the reason that since petroleum