

ore. He states that the ore, which consists largely of rhodocrosite, occurs as a lode from 3 ft. to 10 ft. wide, and traceable for a distance of 5 to 7 chains. A sample taken at that time and freed from the black oxides of manganese was found to contain*—

	Per Cent.
Carbonate of manganese (rhodocrosite)	63.03
Silicate of manganese (rhodonite)	18.23
Carbonate of iron (siderite)	4.00
Carbonate of lime (calcite)	14.48

The largest outcrop is on a hillside about a mile and a half south-east of Paraparaumu Railway-station and 660 ft. above sea-level. The cut exposes ore over an area about 10 ft. wide and 5 ft. high, but the relation of the ore to the country rock is not shown. The ore consists chiefly of hard dark oxides of manganese and soft earthy-looking "wad." The black ore contains patches and fine inter-lacing veinlets of the pinkish-brown rhodochrosite and some crystals of calcite. About 3 chains south-south-west is a turf-covered trench with large blocks of black ore beside it, and on the creek-bank a chain or so farther south manganese-ore is also exposed. In the next gully north from the main outcrop are several old trenches, but no trace of ore was observed.

The outcrops are probably part of a lode which strikes north-north-east parallel with the steep north-west face of the main ridge of hills between Paraparaumu and the valley of the Maungakatukutuku. This steep face is probably a fault-scarp, and the manganese-ore is thought to have been deposited along the fault itself. The greywackes and argillites of the Tararua Range and most of the mountain-ranges of the North Island contain a small proportion of manganese (see analyses, N.Z.G.S. Bull. 18, p. 72). This is leached out of the rock by surface waters containing carbon dioxide, and redeposited usually as nodules and pockets of manganese oxide, but occasionally as lodges and in the form of manganese carbonate. Numerous small pockets of ore have been reported from the Wellington District, and larger deposits have been worked in North Auckland and on Waiheke Island. Lodges of manganese carbonate in part altered to the oxides are known in Germany, Japan, and the United States. These do not extend to great depths, exceptionally to 200 ft., and are interpreted as having been formed by descending surface waters. The Paraparaumu deposit, from the little that can be seen of it, probably resembles those of Thuringia and the Harz of Germany.

The chief uses of manganese are in the steel and chemical industries, and the world's supplies are drawn largely from Russia, India, and Brazil. The deposits, which are a different type from those of New Zealand, are very extensive, and labour is cheap, so that there seems little chance of New Zealand manganese competing in the open market. At the present time ore containing from 47 to 50 per cent. of manganese is worth, c.i.f. London, from 1s. 2d. to 1s. 4d. per unit (about £2 15s. to £3 3s. per ton.) The highest-grade-ores—containing, say, 65 per cent. of manganese—used in making dry cells, are worth considerably more. The sample of which the analysis is given would contain about 37 per cent., and ore of this tenor, if saleable at all, would probably be worth about £1 10s. per ton in London.

8. DAM-SITES IN THE AKATARAWA AND WAKATIKEI VALLEYS.

(By J. HENDERSON.)

The Wakatikei and Akatarawa, which drain part of the southern end of the Tararua Mountains, join the Hutt respectively twelve and fifteen miles from where that river discharges into Port Nicholson. The Tararua highlands are elongated north-north-east, and consist of greywackes and argillites closely folded in the same general direction. The precise direction of folding cannot be stated, since the strikes of the strata are locally altered by faulting, and by the tilting and warping of the earth-blocks. During the folding, which probably took place in late Mesozoic times, the rocks slipped along bedding-planes and were in parts fractured and faulted. There then ensued a long period of stable conditions when the shattered zones were consolidated and more or less recemented by infiltrating quartz, and erosion reduced the whole region to a surface of low relief. Earth-deformation followed in late Tertiary times; the crust was ruptured along many faults, the earth-blocks between were raised to different heights and tilted and the land, as it now is, was roughly shaped out. Regional up-and-down movements and the forces of denudation have since produced the present topography.

The chief faults formed during this last deformation tend to follow the lines of weakness produced by earlier folding—that is, the bedding-planes of the weak argillites and old fault-lines. A complex zone of faulting strikes north-east along the western side of the Hutt Valley, and a branch from it gently curving north, has determined the main Akatarawa Valley. Another well-marked north-east fault follows the upper valley of the Pahautanui, enters the Wakatikei basin above the Wainui junction, and turns north along the main stream. Between these faults, in the valley of the Little Akatarawa, there are numerous parallel fractures which, as far as can be made out, follow the bedding-planes of the strata. The many abrupt bends of the Little Akatarawa are probably due to the stream in the longer and wider reaches following the bedding of the softer rocks and faults, and in the narrow gorges cutting across the strata.

The dam-site at the bridge by which Snow Hill Road joins the Little Akatarawa Road is topographically favourable, in that the valley is here constricted a short distance below a relatively long open reach. The rocks at the site are well exposed by the benches at stream-level on both sides and by the extensive side-cuttings of the roads, the surfaces of which are 10 ft. or 12 ft. higher. They strike some 10° or 20° west of true north, and dip steeply west. The stream here crosses the strike

* Dom. Lab. Rep. No. 33, p. 14, 1900.