

encouragement from this source, as the rapidly-altering character of the Waitemata deposits would tend to show that dynamic forces were at work during this period, causing frequent oscillations of the land, thus preventing the accumulation of sufficient vegetable matter at any period to form workable coal-seams.

Workable seams of coal exist on the flanks of the Hunua Range, and dip in the direction of the Waitemata, but it is doubtful if they reach as far as Auckland, and, if they do, they would certainly be found at a great depth—probably not much under 800ft. or 1,000ft., judging from the thickness of strata which is known to exist between the Waitematas and the coal at other places.

Auckland stands in the centre of a great synclinal or trough, and the depth to be penetrated there would be greater than at any other point. Towards Howick on the one side and Riverhead on the other the depth of strata to be passed through gradually decreases until, on the flanks of the Hunua and Maraetai Ranges, the coal crops out on the surface. In the case of the upper reaches of the Waitemata, wherever the old floor or basement rock is found at or near the surface, and whether it is composed of hydraulic limestone or slaty shales, a careful search should be made for indications of coal, for it was on such old floors that the coal vegetation grew and flourished in the older Tertiary times.

If, therefore, there is a probability of coal on the shores of the Waitemata, it will be found in the upper reaches, in the direction of Riverhead, where the edges of the lower members of Cretaceo-tertiary formation are upturned against the basement rock.

ART. XXXIII.—*On the Occurrence of Native Zinc at Hape Creek, Thames.*

By JAMES PARK, F.G.S., Lecturer, Thames School of Mines.

[Read before the Auckland Institute, 24th August, 1891.]

LAST month Mr. George Manton, a settler on the right bank of Hape Creek, discovered in his garden a heavy metallic substance, which he handed to me for identification. This substance proved on examination to be metallic zinc, of great purity, and coarsely crystalline structure.

In reply to my inquiries Mr. Manton informed me that when removing a quantity of gravel and boulders which he had excavated from the well in his garden he was attracted

by the unusual weight of a soft flat-shaped stone about 6in. long and 2in. wide. The stone on being broken exhibited a thin slab of a dull heavy metallic substance, with an irregular surface, and tapering at the edges. It was easily detached from its matrix.

This thin slab of zinc weighed about 4oz. On freshly-broken surfaces it showed a brilliant metallic lustre, and a white, slightly greyish, colour and streak. It was coarsely crystalline in structure, with a perfect cleavage, apparently parallel to the chief rhombohedron R. Chemically it seemed to be pure zinc. In external appearance, but not in colour, it resembles the thin flakes of native copper found in serpentine rocks of the Dur Mountain mineral belt, Nelson.

The formation in which the metallic zinc was found is composed of stratified clays, sands, and gravels, intermingled irregularly with large boulders of solid andesite and quartz. It is of Pleistocene age, and extends from Waiokaraka Gully, across Irishtown and Block 27, to Hape Creek. The material composing it has been derived from the adjacent country, and there is abundant evidence to prove that it was formed by the Hape and Karaka Streams during a period immediately preceding the last general upheaval of this area.

The point where the metallic zinc was found lies in a direct line with the old course of Hape Creek, which drains the southern slopes of Una Hill, which is itself composed of rudely-stratified tuffs and breccias of pyroclastic origin, with intercalated sheets or flows of hornblende-andesite. The gold-bearing quartz veins intersecting these tuffs and breccias are often highly impregnated with blende as well as pyrites and antimonite.

Metallic zinc is a substance so readily acted on by dilute acids, or even acidulous waters, that it is hardly known in a native state. Dana, in his "System of Mineralogy," mentions only two instances of the supposed occurrence of native zinc. One is reported by Professor Ulrich, who describes the zinc as having been found in a geode in basalt, near Melbourne, the piece weighing $4\frac{1}{2}$ oz.; the other is reported in the gold sands of the Mittamitta River, north of Melbourne, associated with topaz, corundum, &c.

In the present instance the zinc was found in an ancient drift, and its great purity and crystalline structure strongly point to its native origin. It has been deposited in the Auckland Museum.