Why the lodes show preference for synclinal axes rather than anticlines cannot be satisfactorily answered at this stage of the survey, the only reason apparent is that synclinal axes are more thoroughly sheared than anticlinal axes, and the shears possibly extended to depths where they tapped magmatic solutions. It may be that at depths the down-folded axial parts of synclines were ruptured by tension fractures that would provide channels for ore-bearing solutions, whilst the axes of anticlines were in compression and the axial fractures closed.

Geophysical Prospecting.

Electrical and magnetic surveys were made during this field season and are still in progress. It is not the intention here to describe this work in detail. The lesson to be learned from it is that intensive geological studies must be completed and working theories formed on the possible sites of ore-bodies before geophysical work can be usefully employed.

Electrical methods with the ratiometer and megger were tried along the sheared synclinal axis at Black's Point in search of possible northward and southward extensions of Anderson's lode and in the main syncline southward from the Keep-it-Dark Mine toward Progress battery. Electrical work was also done on the north continuation of the anticline eastward from Reefton.

In the Merrijigs district a rectangle, a square mile in area, was surveyed along the axial part of the main syncline. The rectangle was subdivided by co-ordinate and electrical and magnetic observations taken along these co-ordinates. When this work was completed electrical studies were extended north and south beyond the rectangle. This work is now in progress. Narrow zones of low resistivity, perhaps mineralized shears, were traced; trenching and pitting is now required to establish what these electrical indications signify. The relation of the diabase dykes of the region to the lodes and their relative ages are doubtful. Magnetometer observations were carried out at Inglewood Mine, Murray Creek, Devil Creek, and Merrijigs, in an attempt to find the relation of dykes to the lodes. Several additional dykes were found, and the limits of some previously recorded were extended.

Conclusion.

The structural control of the Reefton lodes outlined here is economically important, and future search for lodes in this region, either geophysical or direct methods, must be guided along favourable geologic structures, preferably the axes of major synclines and, less attractive, along anticlines. Haphazard prospecting now has a poor chance of success.

The major folds should be mapped and their axes carefully studied. Payable ore-bodies seem all to occur within 300 ft. or 400 ft. on either side of these axes, and quartz lodes beyond these limits seem to be barren or of low grade. This eliminates wide tracts of rough country and narrows down the search. Particular places along the axes seem to be preferred sites for quartz deposition, probably along the more thoroughly fractured stretches and where the sinuous axes alter slightly in direction. But these are not the only controlling factors, and others, so far unknown, may be more fundamental.

WHAKAEA SUBDIVISION.

(By J. Healy.)

During the past field season an area of approximately 250 square miles was mapped in detail, comprising the survey districts of Chatton, Otama, and Wendon. The area, the southern boundary of which is three miles north of Gore, lies immediately to the east of the Mataura River and stretches northwards as far as Wakaia Township. It includes the township and goldfield of Waikaka, the scene of extensive dredging operations during the period 1900–15.

Topography.

The district is readily divisible into two topographic units, separated by a fault tending north-east and passing a mile north of Waikaka and two miles north of Chatton. To the south-east is low, terraced country; to the north-west three elevated ridges, lying north and south, rise to heights exceeding 2,000 ft. at the northern part of the present district. Mount Wendon (2,769 ft.) is the highest point, and is part of the southerly continuation of the Black Umbrella Range, from which it is separated by the low saddle between a tributary of Waikaka Stream and the Leithen Burn.

A low ridge, of average height 600 ft. to 650 ft. above sea-level, runs for four miles north-east from Chatton, and a similar ridge, of average height 750 ft., trending north and south marks the east boundary of Chatton Survey District. Between these ridges is a flat terrace sloping gradually inwards towards the wide valley of Waikaka Stream, 200 ft. below. Remnants of 150 ft. and 20 ft. terraces border the main valley, indicating at least two periods of rest during the last movements of uplift. North-east from Chatton the ridge falls away into the broad valley of Okapua Creek, which flows south-west and joins the Mataura River near Knapdale.

The valley between the elevated block of which Mount Wendon forms a part and the ridge to the west is drained by the upper portion of Waikaka Stream, which flows south along a wide valley until, west of Waikaka, it enters a two-mile gorge from which it emerges into a wide valley. The gorge is apparently a superposed feature. Waikaka Stream has been beheaded by Winding Creek, which escapes westward through a gap in the mountains and joins Whakaea River near Wakaia Township.

Otama, Pyramid, and Wendon Streams, south-flowing tributaries of Mataura River, and Stony Creek flowing north to Winding Creek drain a meridional depression midway between Waikaka and Whakaea Valleys. At the western border of the area is the broad flood-plain of Whakaea River, which flows south and joins Mataura River near Wendon, whence the Waimea Plains stretch away to the north-west.