

weak dark phyllites of the overlying Mount Arthur Series, is along a fault which extends north and north-north-west for at least fourteen miles.

The rocks of the Mount Arthur Series, in ascending order, consist of dark phyllites, massive quartzites, and thick bands of marble passing upward into black siliceous phyllites and quartzites. The somewhat poor graptolites found in the phyllites have not yet been examined by any expert, but provisionally the Mount Arthur Series is considered to be of Upper Ordovician age. The west boundary of the series is the simple slightly curved fault above mentioned, and its eastern an intricate contact with intrusive rocks lying eight to twelve miles to the east. The structure of the Mount Arthur beds is extremely irregular, and on the whole they dip much less steeply than the other Palæozoic rocks.

The Tertiary (Oamaruan) strata of the northern part of the subdivision occur as patches that have escaped denudation along the Karamca fault-angle and in small areas exposed below the gravels in the Takaka trough. Tata Islands and Taupo Peninsula, on the northern shore of Totaranui Survey District, are also formed of Tertiary rocks. In this part of the subdivision the lowest bed is usually a massive limestone that grades upward into a calcareous mudstone followed by argillaceous sandstone and massive sandstone. The limestone rests on a gently undulating surface of Palæozoic rocks, and at many points contains in its lowest layers rounded pebbles and cobbles of quartzite and siliceous greywacke. Thick arkositic grits with bands of carbonaceous shale and a seam or seams of brown coal occur beneath the limestone at Motupipi and in the Takaka Valley not far north of the subdivision. Except close to faults the strata are nearly flat or dip gently.

The Moutere gravels form a vast mass of river-gravels occupying the depressed eastern portion of the subdivision. They were deposited after the fault-movements usually regarded as marking the close of the Tertiary had ceased. On the other hand, they are well consolidated and deeply weathered, facts that suggest they belong to the Tertiary rather than to the Pleistocene. The only fossils observed in them were a few silicified tree-trunks exposed in the cliffs on the coast south of Moutere Inlet.

The terrace and flood-plain gravels of the Takaka and other streams are the chief younger Pleistocene and Recent deposits of the area examined. There are a few square miles of gravel country at Canaan, on the Pikikiruna highland, some 2,400 ft. above sea-level. This area, which is entirely surrounded by hills of igneous rock or marble, is drained by subterranean streams to the Takaka. Other Pleistocene deposits are the moraines of the mountain-valleys and the much-denuded remnants of a gigantic slip and scree deposit from the marble scarp of the Pikikiruna Range that rests on Tertiary beds near the southern end of the Takaka trough.

A great mass of basic igneous rock intruding Mount Arthur sediments extends from the lower valley of Riwaka River south-west for more than twelve miles to the Graham Valley. It varies from a mile and a half to three miles across, and consists for the most part of gabbro grading in places to pyroxenite and in places to basic diorite. Numerous diabase and gabbro dykes at the southern end of the Pikikiruna Range suggest that the igneous mass extends farther north-east but is there concealed by a cap of Palæozoic rocks. Two large masses of gabbro and hornblende rock intrude the marble in Rameka Creek, at the northern end of the same range. Another large body of basic rock lies in and between the valleys of the Cobb and upper Takaka. It extends north and south about five miles, and is from a mile to a mile and a half wide. Pyroxenites and more basic rocks occur in large amount, and are in part serpentinized.

Granite covers large areas in Totaranui, Kaiteriteri, and Motueka survey districts. Along the shore of Tasman Bay the rock is a biotite granite, at many points containing large crystals of orthoclase. Westward these phenocrysts disappear and hornblende tends to take the place of biotite. In many localities near the contact with the Palæozoic marbles sphene is a prominent constituent.

Numerous dykes of basic and acid rocks intrude the ancient sediments at many widely scattered points. In several localities granite dykes were observed to cut the basic rocks, whereas basic dykes are nowhere known to intrude granite.

#### ECONOMIC GEOLOGY.

Alluvial gold was formerly won from the beds and terraces of the Takaka, Waingaro, and Anatoki rivers and their tributaries. These diggings, which began in the late "fifties," were worked for many years, though at no time did they maintain a large number of miners. A few years ago coarse alluvial gold was obtained from a small branch of Rameka Creek, and recently shallow gravels have been sluiced for gold at Canaan.

Grains of platinum or of alloys of the platinum metals occur with the alluvial gold of Takaka River and Waitui Stream.

Quartz veins carrying gold and various base metals are known in several localities; some have been superficially prospected, but none is being worked at present.

The serpentine masses in the upper part of the Takaka Valley contain many veins of chrysotile-asbestos. The asbestos deposits have been known for many years, but are in barren rugged country far from any road, difficulties that have prevented them from being thoroughly explored or commercially worked.

Building-stones occur in large amount in that part of the subdivision examined last season. The most valuable are the marbles, which outcrop over many square miles on the southern end of the Pikikiruna Range and along both sides of the Takaka trough. The rock has been quarried at various points, and a considerable amount used in building. There are large quantities of high-grade stone in many pleasing shades of light and dark grey. Granite was formerly quarried at Tonga Bay. The rock, a medium-grained grey granite, is deeply weathered, and fresh rock was not exposed in the quarries. The dark basic rocks of the Riwaka and Rameka valleys could be reached from existing roads without much expense.

Pulverized limestone for agricultural use is produced from the marble of the Riwaka Valley. The Tertiary limestone of the lower Takaka Valley has been quarried to supply local kilns and kilns in Nelson. Unworked deposits of soft travertine containing several hundreds of tons occur at the southern end of the Takaka trough.