

The rocks outcropping are almost solely volcanic, though in a few places sandstones of Lower Miocene age are exposed. While in the Rotorua-Taupo Subdivision the most abundant rocks are rhyolites, in the Tongariro Subdivision they are mainly andesitic flows, scoria, and conglomerates. White pumice blown from a vent in Lake Taupo is a widespread surface deposit, usually only a few feet thick.

TOPOGRAPHY.

The volcanic mountains, which are the most conspicuous features of the district, rise from a plateau 2,300 ft. to 3,000 ft. above sea-level. The main peaks are Ruapehu, Ngauruhoe, and Tongariro, and they lie on a line trending north-north-east. Ruapehu (9,175 ft.), at the extreme southern end of the volcanic belt, is a shapely cone with an oval unevenly flat summit about one mile and a half in diameter. Tongariro (6,458 ft.), eleven miles to the north and separated from Ruapehu by a saddle 4,200 ft. high, is a truncated cone nine miles long and five miles wide at its base, and about five miles long and two miles wide on top. The summit is very irregular, for there are many peaks on it more than 5,000 ft. above sea-level. Ngauruhoe (7,515 ft.), a symmetrical volcanic cone, rises from the southern portion of the truncated top of Tongariro. Ngauruhoe is still active; a column of steam can usually be seen rising from its crater, and occasionally rock-fragments are blown into the air.

The extinct volcanoes Pihanga (4,352 ft.), Tihia (3,824 ft.), and Kakaramea (4,269 ft.), aligned in a north-east to south-west direction, occupy the north-eastern corner of the subdivision. Their northern slopes end near Tokaanu, on the southern shore of Lake Taupo (1,200 ft.).

The plateau on which all these volcanoes stand declines gently outwards from a height of 3,000 ft. to a height of 2,300 ft. on the western boundary of the area, where it merges into the well-dissected Wanganui peneplain. On the mountains the stream-valleys are shallow, but at a distance of seven miles from them they all flow in narrow precipitous gorges as much as 200 ft. deep.

The largest lake in the subdivision is Roto Aira (maximum depth, 45 ft.). It is nearly four miles long, and occupies a portion of a long depressed area between Tongariro and Pihanga. Small lakes occur in the craters of Ruapehu and Tongariro and in the saddle between.

GENERAL GEOLOGY.

The table below shows the sequence in downward order and the approximate age of the rocks encountered:—

1. Andesite ash and scoria from Ngauruhoe, &c. (Recent).
2. White rhyolite pumice from the Taupo vent (Recent).
3. Dark andesite flows, scoria, and ash, from Ruapehu, Tongariro, and Ngauruhoe; olivine basalt from Pukeonake (Pleistocene and Recent).
4. Grey andesite flows, agglomerates from vents beneath Ruapehu and Tongariro, andesite from Kakaramea and Pihanga (Pleistocene).

(Unconformity.)

5. Sandstones of the Mokau Series (Lower Miocene).

The Tertiary sandstones with their thin bands of greywacke conglomerate are the oldest rocks, and only outcrop in the gorges of the deeply entrenched streams that cross the plateau. The beds wherever observed have an extremely low dip, amounting to not more than 2°. Dr. Marwick states that fossils gathered from the Whakapapa Stream belong to the coal-bearing Mokau Series (Lower Miocene) of Bulletin No. 24. A strong fault between National Park and Raurimu Railway-stations with downthrow to the east and strike north and south brings them against the Mohoenui Series.

Following a period of faulting and erosion in Pleistocene times, volcanic eruptions commenced and still continue. Ruapehu and Tongariro, more particularly the latter, have complex histories. "Ancient Ruapehu" was built up of grey andesites probably to a height a little greater than it is to-day. Its top down to about the 7,000 ft. level was removed by collapse or by explosions, but later lava-flows have almost restored the mountain to its former shape and size. Three grey andesite ridges extend up to about the 7,000 ft. level, the most prominent being that on which are situated the needle-like rocks called the Pinnacles. The latest lava-flows from Ruapehu, extending far down the valleys, are dark-coloured and have a rough surface similar to the "aa" of Hawaii.

Conical hills of all sizes up to 30 ft. in height are numerous on the north-western slopes of Ruapehu. They occur at a height of 4,000 ft. and form a belt two miles wide that extends down the slope a distance of five miles to the 2,300 ft. level. Two at least are single blocks of agglomerate. They are not underlain immediately by lava-flows, and thus cannot be blisters on a lava-stream as stated by Hill.* Park† considers the hills are of glacial origin, but the writers think they are part of a mud-flow that came from the crater of Ruapehu.

"Ancient Tongariro" was an elongated mountain of grey andesite with several craters, the rims of which were perhaps a few thousand feet above the present highest peaks. The mountain was subsequently broken up by collapse and by explosions on a grand scale, and altogether about nine new craters were formed, the bigger ones being located on its southern half. Shortly afterwards floods of lava issued from North Crater, and ran down into Lake Roto Aira. Near the close of activity from this centre the lava rose in a crater some 55 chains in diameter, bounded on the south and north sides by steep walls up to 180 ft. high. This gentle outwelling of lava was succeeded by explosive eruptions which built scoria cones, much the largest being Ngauruhoe, that rises 2,100 ft. above an old crater near the southern end of Tongariro. Other scoria cones on Tongariro are Red Crater and Te Mari, in

* H. Hill: Trans. N.Z. Inst., vol. 37, p. 457; 1905.

† James Park: Trans. N.Z. Inst., vol. 42, p. 580; 1909.