

Ngauruhoe cone. Some of the more recent lava streams from Ngauruhoe are seen flowing down the steep sides of the cone into its floor. Immediately on the north-west side of this crater, and forming portion of its northern wall, stands the highest peak of Tongariro, 6,458ft. above sea-level, the crater-floor to the south of it lying 1,050ft. below; the walls are extremely steep and in many places precipitous, and extend round the north and east sides, the Red Crater being situated on the north-east wall. Sharp, rugged peaks characterise its summit on the south-east side. In this crater the Mangatepopo Stream may be said to take its rise, falling over rugged lava cliffs 1,000ft. into the valley below.

Ngauruhoe, one of the prominent features of the volcanic chain, is a beautifully symmetrical cone, rising in almost sugar-loaf shape from amidst the ruins of former cones, its height above the sea being 7,515ft.; the sides are formed partly of scoræ-ash and cinders alternating with lava streams, the average slope being from 37° to 40°. We ascended the mountain twice during the progress of my survey; it is easiest ascended on the south-west side, where a lava stream flowed down from near the summit to the base, which, though rough and rugged to climb over, affords good footing, its slope varying between 30° and 40°. On reaching the summit on both occasions we found it impossible to see down into the crater, so dense was the column of steam rising from it. Jets of steam and vapour rush out from clefts at every point round the bottom and sides with great force, and with a hissing noise so loud that we could with difficulty hear each other talk; the vapours, charged with pungent gases and acids, were all but suffocating, making it dangerous to approach too close to the crater lips. Occasionally the wind, which came strong from the southwards, blew the steam on one side, and enabled us to get a glimpse of portions of the interior. The crater is almost circular, with steep rugged sides to the east, the upper portions of which are overhanging. The diameter is 25 to 30 chains, and the depth is, I believe, 120ft. On the north-west side, just within the margin of the crater, a second cone has been built up; it is about 150ft. in height, and its crater has a diameter from 5 to 8 chains of regular funnel shape; it is slightly breached on the north-west side where two lava streams have flowed out in recent times, one said to be in the year 1869. Both these streams afford instructive evidence of how steep a slope lava will cool and consolidate at; they extend down the steep cone, almost from the summit to the base, at an angle of 39°. Considerable changes must have taken place in the summit of the cone since Hochstetter visited the district in 1859, as shown by his sketches, and compared to those taken from photographs as the mountain now appears.

The summit has, however, not been much altered since I visited it in the year 1886; a few feet of the overhanging lips on the eastern side, where our trig. station stood, have fallen in, and on the north-east side about 100ft. of the crater margin have also broken down, due to the action of acid vapours. The column of steam from the crater has been much greater and more persistent during my recent visit than I noticed it on former occasions; its density varied considerably at times. I observed an increase of activity when the barometer was falling and a decrease with a rising barometer. The base of the cone covers an area of nearly 4,000 acres; its walls must be well braced together to resist the effects of explosions and the enormous pressure of the ascending lava column, which found release only at the summit, at an elevation of 7,480ft. above the sea-level, or 5,500ft. above the plateau: no fissures appear on the steep sides of the cone from which lava could have flowed. Two miles to the south of Ngauruhoe summit is the interesting crater lake called Nga-puna-a-Tama; it is of an elongated shape, half a mile long from east to west, and a quarter of a mile in width. It is surrounded by high crater walls from 400ft to 500ft. in height and sloping regularly down to the edge of the lake.

Situated in a direct line between this crater lake and Ngauruhoe is a somewhat extensive rift, three-quarters of a mile in length and nearly half a mile wide; its sides are steep and in some places precipitous, being from 300ft. to 400ft. in height. At its northern end some very typical forms of the columnar structure are seen in rhyolite lava (for sketches of which I am indebted to Mr. T. Ryan).

A group of thermal springs at a height of 4,800ft., situated on the north of the Tongariro cone, and called by the Natives Ketetahi, are said to possess powerful medicinal qualities. There are also some mineral springs near the source of the Mangatepopo. One is a soda-water spring of considerable density. The general character of the rocks on Tongariro as stated by Professor Thomas is rhyolite, augite, with andesite, forming the most recent discharges. The last lava streams from Te Mari, the Red Crater, and Ngauruhoe, are of the latter class, and in appearance, texture, and weight are so like basalt that an ordinary observer could not tell the difference.

I should not, perhaps, close my report without a word about the scenery in this district. I scarcely think there is in nature a scene more lovely than that to be viewed from the summit of Tongariro, looking north-east across Roto-Aira and the extinct cones of Pihanga and Kakaramea, and over the grand inland sea of Taupo Lake, whilst from the same point looking south are seen the dilapidated cones and craters of Tongariro summit, with Ngauruhoe's steep cone, and the snow-clad masses of Ruapehu; nor is there, in my opinion, in the colony a more charming journey, so far as landscape is concerned, than that round the margin of Roto-Aira, and along the western slopes of Tongariro and Ruapehu to Waimarino. It is very beautiful to watch the effects of the setting or rising sun amongst these mountains. In the early morning the high peaks are first illuminated, whilst a soft yellow light tips the lower elevations, and soon golden showers spread over mountain and valley, leaving the ravines marked as dark streaks at the bottom. The sunset effects are, perhaps, even still more lovely; the higher peaks are suffused with a crimson glow, whilst the lower slopes are enveloped in dark twilight, the rosy tints remaining with the snowy peaks after the sun has left all the rest of the landscape.

In conclusion I must acknowledge with thanks the assistance which I have derived from Professor Thomas's classification of the rocks of Taupo and Tongariro, and I desire also to express my indebtedness to Mr. T. Ryan for the use of his sketches to illustrate my report, and to Mr. Deverell for his assistance in preparing other drawings.

I have, &c.,

The Chief Surveyor, Auckland.

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