

from the summit of Tarawera, which were clearly visible from Rotorua, did not produce the slightest apparent tremor at that distance. A few insignificant earthquake-rents were seen crossing the flats south of Kaitiriria, but only where there was a drop or unsupported bank.

VII. THE SOUNDS.

The sounds produced during the eruption must have been, from all accounts, appalling to those within a moderate distance. The crackling thunder produced by the electrical discharges, the terrific roaring of the high-pressure steam escaping through the volcanic vents, were combined with terrifying effects.

Much has been said about noises heard at Auckland, Wanganui, and other places. From the times mentioned, these appear to have been due to the reverberating reports accompanying the Tarawera outbreaks. Some of these noises may have been propagated through the atmosphere, and reflected to the earth from the under surface of the stratiform cloud-sheets that were widely spread in various directions over the colony on that morning. Others, again, may have been propagated through the earth. But I have been informed that at the whaling settlement of Tawaite, on the east entrance of Tory Channel, from six p.m. up to about eight p.m. on the evening of the 9th (the night preceding the eruption), loud booming reports were heard as if through the earth. As these reports were previous to any symptom of the loud disturbances at Tarawera, this suggests that they may have resulted from a slight movement along the great fault-lines that traverse the North and South Islands in a north-easterly direction; and, in this case, the immediate cause of the Tarawera outburst may be found in a local fracture resulting from such movement.

VIII. PREMONITORY SYMPTOMS.

The only premonitory symptoms of the coming outburst which have been described were an oscillation in the level of Tarawera and Rotorua Lakes, and the occurrence of earthquakes for some months past in that district, where, as a rule, earthquakes are rarely felt. But neither of these are very characteristic incidents, nor would it be safe on future occasions to base any expectation of an eruption on such phenomena alone. The increased activity of the geysers and hot springs during the past season has also been advanced as having been a symptom of an approaching outbreak; but those who were most familiar with the district will agree that their variation was no greater than is usual under the influence of rapid changes of wind and atmospheric pressure.

The reports of sympathetic outbreaks in other places along the line of volcanic energy from White Island to Ruapehu appear to be quite unfounded. The outburst has shown conclusively that the springs at Rotorua and Rotomahana are quite independent of each other, and of those at other places, thus confirming the observations made by Von Hochstetter long ago, that all the various points at which thermal springs occur are situated round the margins of lakes formed by subsidence of circular areas, and are not connected by an underground system of gravitational drainage.

IX. CONCLUSION.

From the foregoing sketch of the character of the eruption I think there can be little question that it is a purely hydro-thermal phenomenon, but on a gigantic scale; that it is quite local and not of deep-seated origin, and that all danger is past for the present, so far as one can venture to form an opinion on such a subject. The extra activity of the *puias* which has been observed is no doubt owing to the heavy rains that, on the 9th, set in after the longest period of drought which has been experienced in that district for many years, and probably the frequent earthquakes which have of late agitated the ground have contributed to this activity by stirring up the sources of the water-supply, and facilitating the access of drainage-waters to the sources of the heat. But beyond what may be accounted for in this manner I believe there is no increased disturbance at Rotorua, Wairakei, Taupo, and other places. The quiescent condition of Tongariro and Ngaurahoe was plainly shown by the manner in which we observed it to be enveloped in snow. As a rule, on the scoria cone of Ngaurahoe, snow rarely lies, excepting in a few of the gullies, but melts almost as rapidly as it falls. On the morning of the 17th, however, the cone of Ngaurahoe was covered with a great mantle of snow; while the *puias* on Tongariro showed less than their usual amount of steam escaping. The only fresh activity which may be reasonably expected is that which I anticipate when sufficient rain has fallen to cause the overflow of Okaro Lake into the south end of the great fissure, as its former drainage outlet to the Rotomahana Lake appears to me to be completely filled up. If this should occur and a fresh explosion takes place in consequence, it will be comparatively moderate in its effects, as, unlike Rotomahana, the soft, incoherent pumice deposits between the fissure and Okaro Lake are not sealed down by an enormous weight of siliceous sinter.

For some time to come great variations must be expected in the activity of the newly-formed *puias* according to the manner in which changes occur in the atmospheric pressure; but, unless it can be shown that any local change in the barometer is experienced which is not shared by the surrounding district, the barometer affords no indication as to whether an eruption is or is not imminent. One of the most unfortunate results of the eruption, in addition to the disastrous loss of life and the destruction of the country, is the disturbance of the sense of security which has grown up amongst those residing at the Hot Springs; and I believe that many persons are so thoroughly shaken by the horrors experienced on the morning of the 10th that they will not recover their equanimity until they have been for some time resident away from the sounds, smells, and shocks that characterize the district. An analytical report on the nature of the volcanic deposits is appended, and a series of illustrated views will be furnished as soon as executed.

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The Hon. the Minister of Mines.

JAMES HECTOR.