

The amount of pumice to the eastward of where it must have originated is very great. There is a thick covering of drift-pumice on the Kaimanawa Mountains and over a large part of the Urewera country, and over many of the hills on the slope from the main water-parting to the shores of Hawke's Bay. The greater part of these pumice-deposits, as far as they can be studied at and near the surface, give evidence of a rude arrangement such as might be expected from their having accumulated as ejected material during times of eruptions, or the after-effects of strong winds on the same, or their partial assortment in lakes of limited extent, or by the action of rivers. This applies to the surface only; when the deposit is of considerable thickness the lower part usually gives evidence of a considerable regularity, and indicates distinct stratification under water. This is particularly the case on the east side of Lake Taupo, and there are good reasons for supposing that the general surface of the Kaingaroa Plain owes its even regularity to the action of the sea.

The probability that much of the pumice over the northern and western areas, already described, has been deposited under water, and probably on the bottom of a shallow sea, will appear in a yet stronger light on it being shown that large deposits of pumice are interstratified with and form part of the young Pliocene formation of the west coast of Wellington and Hawke's Bay districts. This pumice is so evidently due to the activity of volcanic vents within the Taupo zone that no one has ever thought of endeavouring to show that it had other origin than that here indicated.

Marine fossiliferous pumice-sands on the East Coast were first studied in 1874-75 in the neighbourhood of Gisborne and within the southern district of Hawke's Bay. In 1874 I accompanied Sir James Hector in a trip along the east coast of Auckland from Poverty Bay to East Cape. During various explorations, fossiliferous beds, containing more or less pumice (pumice sometimes predominating), were found on the shores of Poverty Bay, and inland at Ormond, and at many places along the shore-line as far as the hills of the mainland opposite East Cape. In the Pliocene strata the pumice occurred usually as fine sands, and thus the real nature of the material was sometimes overlooked, or referred to as rock matter of another description. Its importance in this connection was not then apprehended.*

Towards the close of 1874 the writer examined the southern part of the Hawke's Bay district and found moderately coarse pumice-sands in Pleistocene strata of the cliffs along the south side of Hawke's Bay, and in beds of older date in the neighbourhood of Waipukurau, and as far south as Dannevirke in the Seventy-mile Bush. Subsequent examinations in the same district showed heavy deposits of pumice-sands on the range immediately north of the Manawatu, and at the same time in the low grounds of the Pohangina Valley, on the west side of the Ruahine Range. At that time the greater part of the district between Woodville and Norsewood was covered with dense forest, and the nature of the rocks could only be determined where exposures took place along the banks of the streams. So that, although pumice-deposits might be observed at many places, the relation of these to the Pliocene beds of a different character was not made out, and all the pumice of the district was referred, not very determinately, to a covering of pumice overlying the youngest marine beds.

In 1886-87 the writer made an extensive examination of northern Hawke's Bay, the East Cape District of Auckland, and the Urewera Country, and determined definitely that while a great deal of pumice formed a covering, usually of no great thickness, over large areas of the district examined, there also were heavy deposits of pumice, both coarse and fine, interstratified with the Younger Pliocene strata from the Manawatu Gorge to Tolago Bay. And, at the same time, it became evident that this pumice had reached into the eastern sea by way of the Manawatu Gorge and the lower mountain heights immediately to the north and south. These pumice deposits were, in the Esk Valley, clearly seen to underlie the limestone of the coast-range in the same district and west and north-west of Napier to add greatly to the average thickness of the formation in which they occurred. At the same time the high cliffs of the coast-line at Gable End Foreland, north of Poverty Bay, were ascertained to be formed of pumice-sands, and similar deposits were found in the East Cape hills and inland amongst the mountains separating the East Coast from the shores of the Bay of Plenty.

Mr. James Park, formerly an officer of the Geological Department, and late director of the Thames School of Mines, in a report on the geology of the western part of the Wellington Provincial District,† describes the Newer Pliocene formation of that district as largely consisting of pumice, gravels, and sands, which are absent from the Older Pliocene and Miocene limestones and clays of the same district. The Newer Pliocene rocks do not extend, as shown in Mr. Park's map, north-west of the mouth of the Waitotara River. Their absence in the district more to the northward is probably due to their removal by denudation, but, as it is, they still extend over a wide area, and are practically continuous with the like deposits of the same age that stretch along the east side of the main chain of mountains through the Hawke's Bay district. The pumice-sands of this formation are described at length at pages 62 and 63 of the report above referred to.

Between the northern boundary of this formation and the southern base of Ruapehu, there is a broad stretch of country extending from the west flanks of the Ruahine Range to Mount Egmont and New Plymouth, over which Miocene tertiary deposits appear at the surface, the Newer Pliocene deposits, once present, having been removed by denudation. The amount of pumice thus present in these beds in Wellington, Hawke's Bay, and East Cape district of Auckland is very great, and shows how violent and extensive were the eruptions within the Taupo zone during the earlier periods of activity.

This wide distribution of pumice, both superficial and as forming part of marine strata, shows how difficult it is to say what the limits of deposit from the Taupo zone may have been, and it justifies the assumption that in great part, if not wholly, the like deposits over the low grounds of the Middle Waikato basin, and the plains through which flow the Waihou and other rivers to the Firth of Thames, had a similar origin within the bounds of the Taupo volcanic zone.

* "Geological Reports," 1873-74.

† "Geological Reports" of 1886-87, pp. 24-73.