

CONCLUSIONS.

It is not to be expected that important mineral discoveries can be made by hasty examinations, and therefore the fact that during the writer's inspection only one sample of phosphate rock, and that hardly of commercial quality, was collected need not give rise to discouragement. On the whole, the indications of phosphate rock in the Whangarei district are hopeful, and further search is therefore desirable. For one thing, excavations ought to be made at the spots where phosphatic specimens have been found, in order to ascertain whether there is any workable deposit, and, failing that, to determine the geological relations of the concretions or other forms in which the phosphate may occur.

The portion of the Hoteo River district from which Mr. S. H. Cox obtained the specimen of phosphate rock analysed in 1904 was not visited owing to lack of time, but the writer has been informed that Mr. J. A. Pond unsuccessfully examined this locality soon after the analysis mentioned was made. A geological investigation may, nevertheless, be recommended as likely to give information of value.

Further exploration for the phosphatic limestone of the Onewhero district ought to be made, and its position determined. Possibly the services of the prospector who collected and forwarded to Mr. J. J. Craig the sample analysed in the Dominion Laboratory can be obtained for this work.

Something remains to be said as to how the search for phosphate rock may be undertaken. In this matter the intelligent co-operation of landowners, who are vitally interested, is desirable. To obtain this a pamphlet on phosphate-deposits similar to that written by Mr. B. C. Aston* a few years ago, but containing additional matter, could be prepared and circulated among farmers and others. The indiscriminate distribution of samples of Clarendon or other phosphate rock is decidedly not to be recommended, for phosphate occurs in many forms, and a single specimen in the hands of a layman is misleading rather than helpful. Representative sets of specimens should be procured from the United States and elsewhere, and placed in the various museums, where they could be seen by all interested. A set of Pacific Islands phosphates and so-called guanos is also desirable, and can be easily procured.

The search for phosphate should not be made the sole object of an examination, but carried on in conjunction either with a geological or a soil survey; or perhaps, preferably, both surveys should be made at the one time by the same organization and staff.

A detailed geological survey of the Whangarei district is highly desirable, mainly on account of its known mineral resources in coal and limestone.

PHOSPHATE OCCURENCES IN THE NORTH ISLAND.

The following list of phosphate occurrences recorded from the North Island of New Zealand may be useful. In a later report (No. 9) a similar list is given for the South Island.

Calcium Phosphate.

(1.) *Whakapara, Hokianga*: A small sample was forwarded to the Agricultural Department in 1908 or 1909. See Seventeenth Ann. Rep. Dep. Agri., Chemistry Division, 1909, p. 176.

(2.) *Whangarei District*: Samples analysed in 1909 gave 58.35 and 55.66 per cent. of $\text{Ca}_3\text{P}_2\text{O}_8$. See Dom. Lab. Rep. No. 43, 1910, p. 53.

(3.) *Hoteo River, Kaipara*: A sample collected many years ago was found in 1904 to contain 71 per cent. $\text{Ca}_3\text{P}_2\text{O}_8$. See Dom. Lab. Rep. No. 38, 1905, pp. 9-10.

(4.) *Onewhero, Lower Waikato District*: A sample of phosphatic limestone on analysis was found to contain 10.60 per cent. of $\text{Ca}_3\text{P}_2\text{O}_8$. See Dom. Lab. Rep. No. 43, 1910, p. 13.

(5.) *Tutira Block, Mangaharuru Survey District, Hawke's Bay*: A sample forwarded to the Dominion Laboratory in 1908 contained 70.84 per cent. of $\text{Ca}_3\text{P}_2\text{O}_8$. There is some doubt concerning the authenticity of this specimen. For analysis see Dom. Lab. Rep. No. 42, 1909, p. 22.

(6.) *Wellington Heads*: A sample of clayey substance from a cave, forwarded by Mr. H. N. McLeod to the Dominion Laboratory in 1908, was found to contain 46.9 per cent. of aluminium and lime phosphates. The Dominion Analyst describes the sample as a "coprolite." See Dom. Lab. Rep. No. 42, 1909, p. 22.

Aluminium Phosphates.

Wavellite and taranakite, the latter described as "a double hydrous phosphate of alumina and potash, part of the alumina being replaced by ferric oxide," occur in thin seams at the Sugarloaves, New Plymouth. See S. H. Cox: "Notes on the Mineralogy of New Zealand," Trans. N.Z. Inst., vol. xv, 1883, p. 1385.

Iron Phosphate.

Vivianite, the blue hydrous phosphate of iron, occurs in a number of localities. Among these are: Thames (James Park, in "The Geology of New Zealand," 1910, p. 402); Mercer, where the mineral is for the most part impure, but occurs in some quantity (James Park, in Trans. N.Z. Inst., vol. 26, 1893, p. 367); Urenui, Taranaki (Col. Lab. Rep. No. 14, p. 28); Pohangina; Wairarapa district (Col. Lab. Rep. No. 13, p. 23); and Kaitoke.

* N.Z. Dept. of Agriculture, Chemistry Division, Bulletin No. 1, "Phosphate in New Zealand," 1906.