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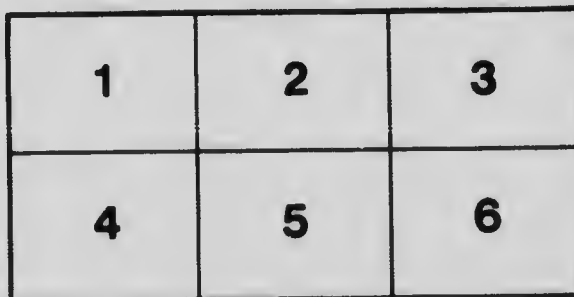
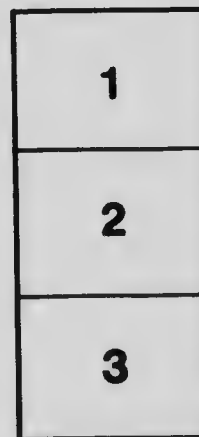
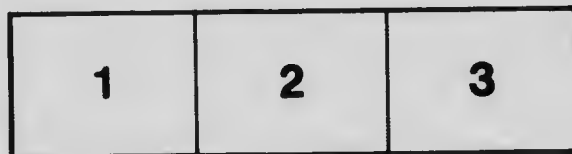
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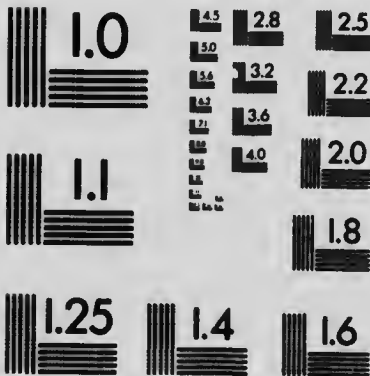
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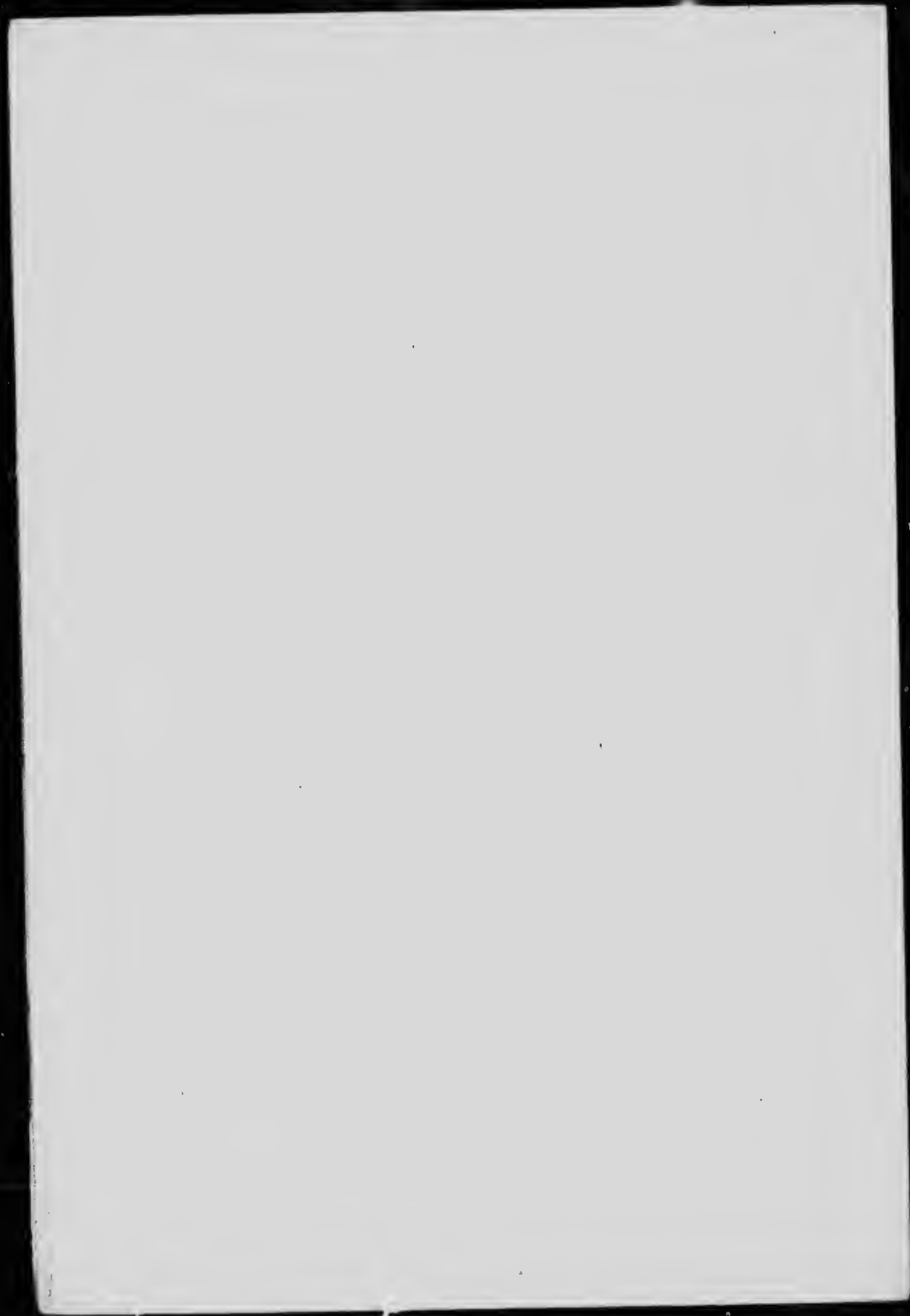
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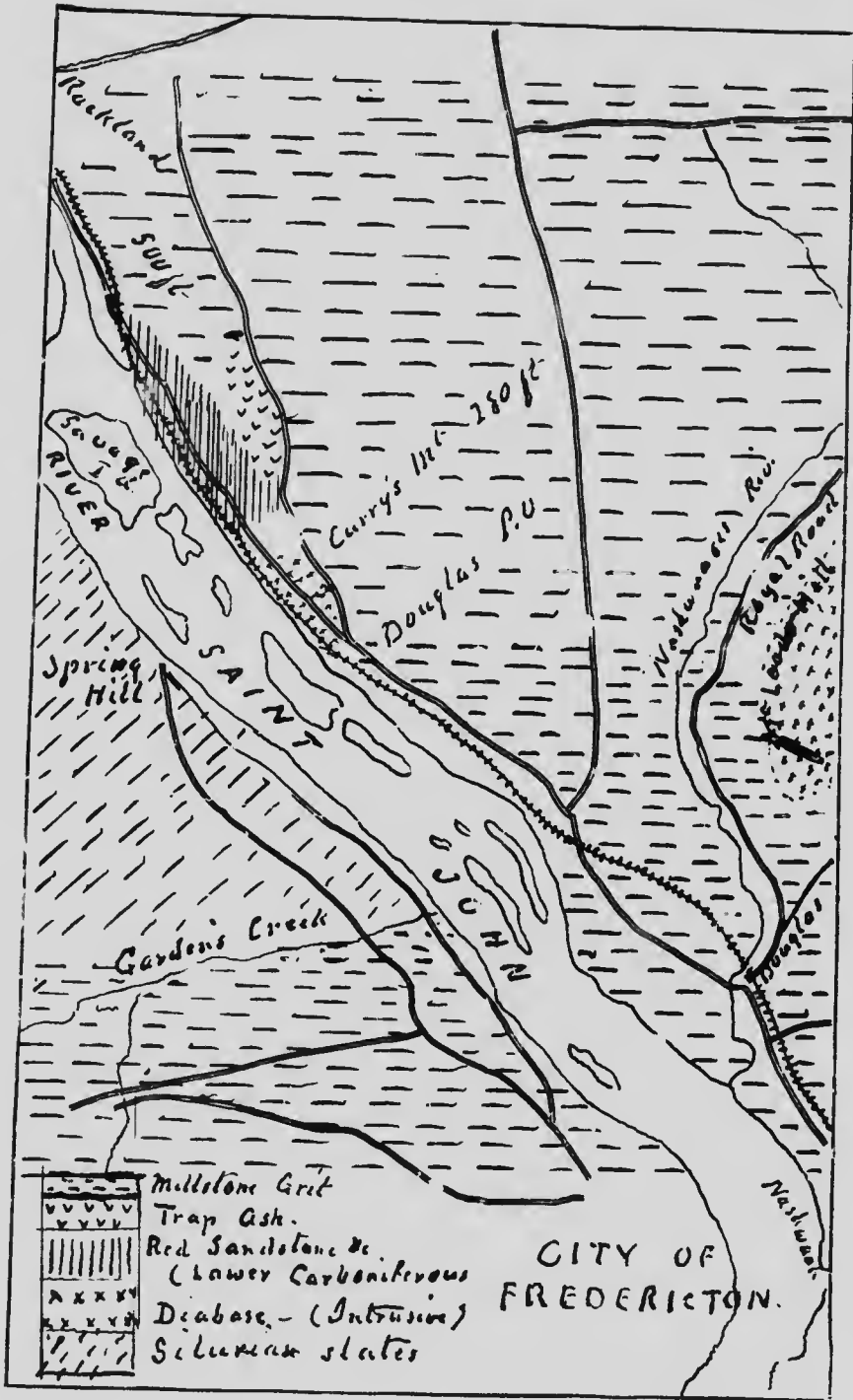
THE
HISTORY OF CURRIES MOUNTAIN
AN OLD NEW BRUNSWICK
VOLCANO



BY L. W. BAILEY, LL.D., F.R.S.C.

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ARTICLE I.

THE HISTORY OF CURRIES MOUNTAIN—AN OLD
NEW BRUNSWICK VOLCANO.

By L. W. BAILEY, LL. D., F. R. S. C.

(Read by Title, May 4, 1909.)

Upon the left bank of the St. John river, about five miles above Fredericton, is the eminence formerly known as Clark's, and now as Curries Mountain. It has certainly no claim to the latter designation, its elevation being quite insignificant, only 280 feet, but rising somewhat steeply from the river's bank, and separated by a marked depression from the hills in the rear, it stands out with some degree of prominence, and is a conspicuous feature in the landscape, as from its sides or summit may be had a somewhat extensive view of the river valley, and of the city in the distance. Along its western slope, near the base, between it and the river, run the highway and the Woodstock branch of the Canadian Pacific Railway; and in the construction of these the structure of the mountain was to some extent revealed; while in the hills behind, traversed by what is known as the "Back Road," leading to Rockland, and which attain an elevation (five hundred feet) somewhat exceeding that of the mountain itself, are other exposures from the study of which information as to the origin and history of the mountain may be had.

Curries Mountain is, in a sense, an old volcano. That is to say, it is of volcanic origin. It is true that it is not now possible to recognize about it anything of the nature of a crater and it may never have possessed one; but volcanic eruptions do not always lead to that result. They may determine outflows along extended cracks or fissures. Craters, even if originally present, may be obliterated by later flows, by sedimentary deposits or

by erosion. The molten rock from the earth's interior, though penetrating the crust, may fail to reach the surface, and subsequently be revealed by the removal of the surrounding beds, or this may come up along a narrow vent, forming a pipe or chimney, and, without forming a crater, overflow the region in its neighborhood. On the other hand the fact of the igneous origin of Curries Mountain is placed beyond question (1) by the study of its rocks as regards their nature and arrangement; and (2) by the relations of these to the other rocks with which they are associated.

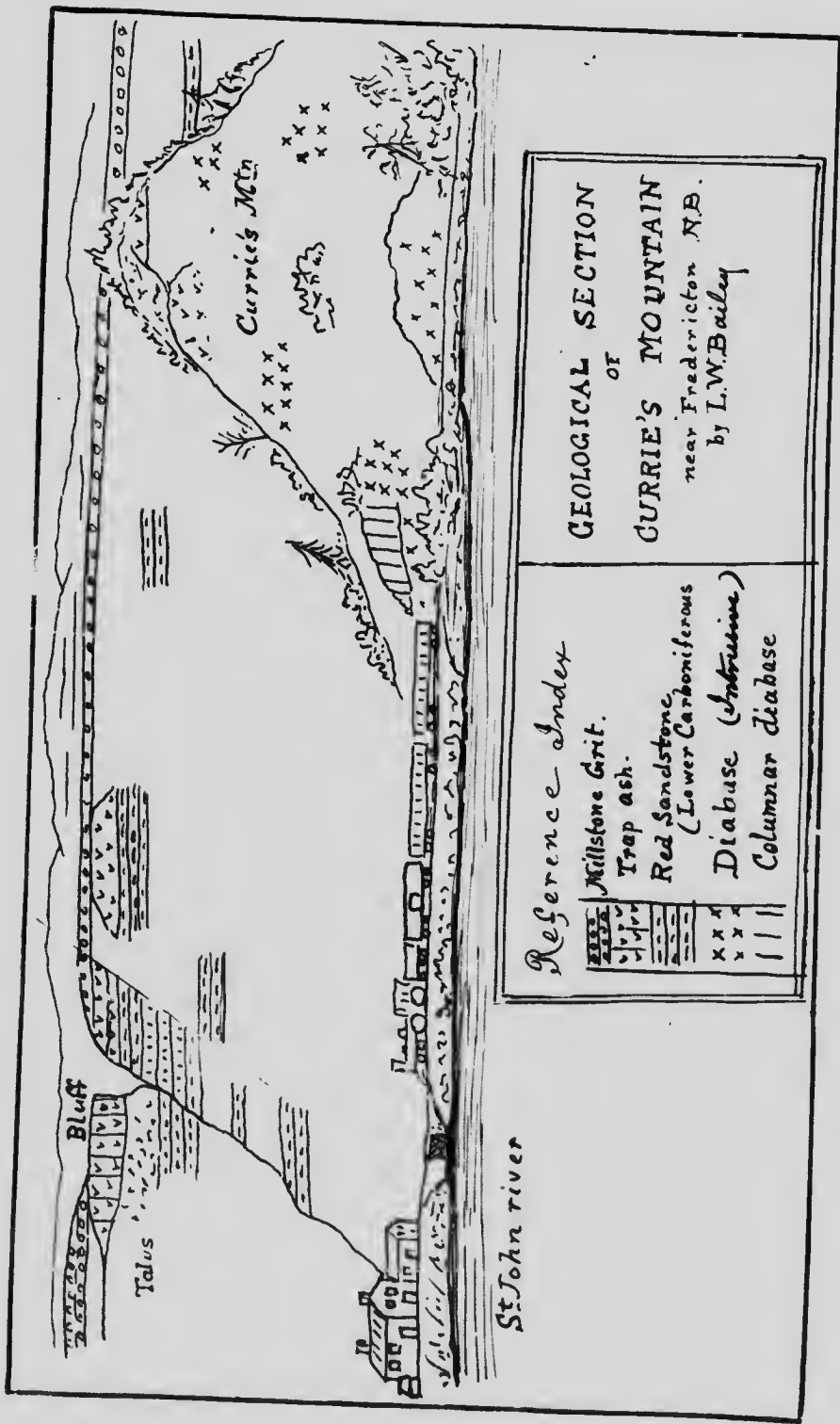
VOLCANIC ROCKS.—The rocks which constitute the main mass of Curries Mountain are of a dark grey, almost black colour, quite hard, of uniform texture and breaking with a broad conchoidal fracture. Fresh surfaces glisten somewhat from the presence of minute crystals, and on the northwestern face of the hill are ledges showing a distinctly columnar structure, similar to that of Blomidon or the Giant's Causeway. Technically the rock is Diabase, a variety of "trap" consisting of an intimate admixture of felspar (labradorite or anorthite) and augite or pyroxene. To the latter, an iron-bearing mineral, the colour, hardness, toughness and weight of the rocks are due. It is an admirable material for road making, and considerable quantities of somewhat similar but inferior rock, derived from the outskirts of the hill or from boulders, have been used in macadamizing the streets of Fredericton, the main mass of the mountain, owing to the cost of removal, remaining still untouched.

No other rock than that last referred to is visible in the mountain itself; but along the crests of the hills which, as already stated, lie in the rear, and extend for several miles in the direction of Rockland, are numerous exposures of beds of related origin. These are of lighter colour than the diabase described above and are earthy rather than crystalline, though not unfrequently containing crystalline minerals. These latter are usually scattered through the rock in the form of blebs or nodules, and include quartz, calcite, heulandite and a variety of chlorite known as delessite. Thus the rock is a sort of volcanic

ash, which in places assumes the character of a coarse amygdaloid or toad-stone. No bedding is discernible in these rocks, but they may be seen to rest horizontally upon non-volcanic stratified rocks to be presently noticed, showing that they are either of the nature of flows or of showers of ashes. They may be well studied on either side of a ravine traversing the hillside about a mile and a half above Curries Mountain, where they form a conspicuous and vertical bluff, half-buried by a talus of detached fragments, and commanding a view probably unexcelled in beauty in the whole valley of the St. John.

SEDIMENTARY ROCKS.—The rocks of this character found associated with the volcanics consist of conglomerates, sandstones and shales, of which those below the volcanics are noticeable for their intensely red colour and calcareous nature, while those above are as uniformly grey and non-calcareous. The former are identical with those which in various other parts of the Province occupy a similar position and are referable to the Lower Carboniferous system, while the latter represent the Millstone Grit formation or Lower Division of the Coal Measures. The latter are remarkable as mainly made up of well-rounded white quartz pebbles. The red rocks may to some extent be seen along the Back Road where this makes its ascent to the hills behind Curries Mountain, but better in the ravine referred to above or along the steep hillsides leading to Rockland. From the height of the hills, the horizontal attitude of the beds, and the position of the exposures, it may be inferred that they have a thickness of at least five hundred feet. The grey beds are not seen in the immediate vicinity of the mountain, but come into view on either side, in one direction becoming continuous with the great Carboniferous tract of southern New Brunswick, in the other helping to mark the northern escarpment of that formation to and up the valley of the Keswick River. They are noticeable, in addition to their coarseness and silicious character, for the extent to which they have been planed and even polished by glacial action. Poorly preserved stems of plants are occasionally found in the red as well as in the grey beds.

STRATIGRAPHICAL RELATIONS.—These may be most readily understood by the accompanying sectional view of the mountain and its immediate surroundings. As has been stated, nothing else is revealed in the mountain itself but compact crypto-crystalline diabase or doleryte, exposed both near its base and on its sides and summit. It thus forms a somewhat conical mass arising from the level of the river and presumably extending beneath it to an unknown depth and rising to a height of nearly three hundred feet. Upon either side the structure is quite different. Thus, quite near the base of the mountain on its northwestern side, are beds of red conglomerate in nearly horizontal position, and which, if they do not underlie the whole mass of the mountain, as seems improbable, must have been penetrated by the volcanic rock in its efforts to reach the surface. This view is rendered almost certain by the fact that upon either side of the mountain similar red beds are exposed to within about sixty or seventy feet of the summits of the hills, being then capped by horizontal masses not of dolerite but of vesicular ash-rock and amygdaloid. Such open vesicular rocks are somewhat of the nature of a slag, their cavities being the result of the expansion of gases under diminished pressure, and they are believed to have been formed at or near the surface, while those of a more solid crystalline character, such as constitute the mountain, were formed at lower levels and under greater resistance. Thus the mountain proper represents a volcanic neck or chimney, penetrating the red sediments from an unknown depth, while the ash beds and amygdaloids are the lighter and more scoriaceous materials thrown off from the summit of the pipe, possibly under water, and spread over the surrounding deposits. These do not include the grey beds. At no point can the volcanic materials be found to rest upon the latter; but at no great distance to the north of the ravine the coarse grey beds of the Millstone Grit formation may be seen in a position which clearly indicates that they lie above the amygdaloids and ash-beds.



TIME OF ERUPTION.—From the facts above stated it is easy to determine the time of overflow of the Curries Mountain lavas. Resting upon the red sediments of the Lower Carboniferous system they could not have reached the surface until near the close of the Lower Carboniferous period, or altogether subsequently; while, covered as they are by the lowest beds of the Coal-period, they must have antedated the latter. The time of eruption was between the two.

CONTEMPORANEOUS NEW BRUNSWICK VOLCANOES.—New Brunswick has been the seat of volcanic activity at many periods during its history both before and since that of which Curries Mountain is a monument. Volcanic products are a very marked feature of the so-called Huronian age, and in parts of St. John and Kings counties, as about Loch Lomond, Kingston and the Nerepis region, cover large areas. They recur again in the Silurian, represented by many of the finer hills about the Bay des Chaleurs, Passamaquoddy Bay and the eminences, such as Mount Teneriffe, Mount Wightman, Sagook Mountain, etc., at the sources of the Tobique and Nepisiquit; and in comparatively recent times there were the outflows now so conspicuously represented in the Bay of Fundy trough by Grand Manan and the North Mountains of Nova Scotia; but the Lower Carboniferous period is also remarkable for the extent to which volcanic operations were then carried on. One evidence of this is not very far removed from the locality which forms the subject of this paper. Upon what is known as the Royal Road, which runs in the rear or to the east of Curries Mountain at a distance of about five or six miles, is a conspicuous bluff known as McLeod's Hill. Like the bluff at the ravine described above, and like most of the beds of volcanic origin of the Lower Carboniferous system, it presents upon one side a bold front, perpendicular towards the top but covered below with broken fragments, while in the opposite direction it slopes off more gradually and is mostly covered by superficial deposits. This

corresponds to what in Scotland is known as the "Crag and Tail." The rock, like that at Curries Mountain, is a dolerite or diabase, but is more coarsely amygdaloidal, containing not unfrequently considerable cavities lined with quartz crystals, or of calcite encrusted with quartz. This overflow may have been connected with that of Curries Mountain, but the connection, if existing, is now obscured by the overlying rocks of the Coal Measures which occupy all the intervening area. Other localities for these volcanic outbursts are: the Miramichi river, about six miles above Boiestown, where again they form conspicuous bluffs; the vicinity of Harvey Station where they include the eminence of Cranberry Hill, at the base of which passes the main line of the Canadian Pacific Railway, as well as Bald Mountain a few miles to the east; the west shore of the St. John river, near Long Island, in Queens County, where they spread over a large area and are associated with beds of limestone which by the heat accompanying their ejection have been converted into marbles; and yet again about the Emigrant Settlement north of Grand Lake in the same county;—in each of these instances exhibiting the same relations to the red and grey rocks, respectively, beneath and above them, as are seen near Fredericton, and hence showing they all belong to the same great period of volcanic activity. The red beds and associated limestones contain in many places corals and other forms of marine life, showing the presence of the sea at the time of their formation; the grey beds on the other hand hold only the trunks and roots of trees and ferns, indicating their origin about fresh water streams and lakes.

HISTORY.—From the above data it is easy to summarize the probable history of Curries Mountain.

In the Lower Carboniferous period, antedating our own by some millions of years, the sea covered a large part of New Brunswick, including not only the great central triangular basin now occupied by large portions of York, Queens, Sunbury, Northumberland and Gloucester counties, but also a considerable

part of both the northern and southern Highlands. In the south they are found on the top of the Quaco Hills and Shepody Mountain, nearly one thousand feet above the present sea-level; in the north they form high hills on the Beccaquimic river and about the Blue Mountains on the Tobique, though it is not probable that they ever covered the summits of the latter range or the much higher hills about the sources of the Tobique and Nepisquit rivers. In the central basin and in the depressions among the higher hills waves, tides and currents were at work, and by their action the hills were being levelled and the depressions filled with pebble, sand and mud beds, the conglomerates, sandstones and shales which now occupy them. Here and there, where the waters were pure enough, corals were growing and shells accumulating, the former indicating that the temperature of the waters was at least sub-tropical. In the same waters were numerous fish, but mainly of types related to the sturgeon and shark, and along the shores basked frogs and reptiles of gigantic size in comparison with their modern relatives. For untold centuries this condition of things prevailed, the sediments gradually becoming thicker and thicker until they had attained a maximum of some thousands of feet. This would only be possible upon a sinking floor, and with a sinking floor sooner or later fractures must come. In the production of these fractures the Lower Carboniferous period came to a close; through the vents thus made, sometimes perhaps in single pipes or chimneys, in other cases along extended fissures, came floods of molten material from the earth's interior; in the eminences which have been referred to as occurring in Curries Mountain and elsewhere we have, now open to our study, what has been left of these old ejections. For we can hardly suppose that the whole of the materials poured out have been left undisturbed, and some of the events in the later history of the country were well calculated to remove them. Yet it does not seem probable in the case of Curries Mountain that its height was ever considerable. Its present base is too small to justify such a belief, and the relations of the sedimentary to the igneous rocks also

points to a different conclusion. For had volcanic action continued into the Coal-era, or had there been then any considerable eminence subject to wear and waste, the products of such waste would be found in the Carboniferous strata, at least in the vicinity of the hill. None such have been observed, and considering the origin of the strata last mentioned, in fresh water swamps and estuaries, it would seem probable that the mountain, so called, was at this period not only quiescent but actually buried beneath many hundreds of feet of sedimentary rocks. Still the mountain must have been somewhat higher than now, for the ash beds derived therefrom are found nearly two hundred feet higher in position than the summit of the mountain, which must therefore have been cut down at least to that extent. Just when the overlying materials were removed or when the old pipe or chimney, by becoming exposed, was thus made liable to loss, we know not. It may have remained buried through all the vast lapse of time represented by the formations, Triassic, Jurassic, Cretaceous and Tertiary, which followed the Carboniferous, but of which the region affords no record; but it is hardly possible that the Ice age, with its powerful instruments of erosion, could have passed without materially affecting the region, as it did all others subject to its influence. And the wonderful exhibition of planed and polished rocks to be seen, not far away, upon the Rockland hills, leaves little doubt upon this point. They show beyond question the presence of ice in such quantity, and moving under such pressure, that the pebbles of conglomerates several inches in diameter and composed of pure quartz, have been cut through or planed down as though they had offered no resistance whatever to the abrading agent. For a time, no doubt, and possibly for a long time, this mantle of ice and snow believed by many to have been some thousands of feet thick, would have still farther buried the seat of the old volcanic fires as it did the beautiful valley of the St. John near by; but with the return of less rigorous climatic conditions, and as the result of the floods following the melting of the ice, the mass now forming the mountain had its load removed, and the

surroundings were made to assume somewhat nearly their present aspects.

Only a few more words are necessary. The view which the hill commands—one of the most beautiful, as has been said, which the river affords—includes two very large islands, Sugar and Indian islands, lying between the main river and the mouth of the Keswick. As indicated by its name, one of these was formerly a favorite camping-place of the Indians, and tradition tells of severe conflicts here between the native tribes and the invading Iroquois from the west. Stone axes and other implements of like nature are not of uncommon occurrence, and in connection with the excavations made at the base of Curries Mountain for the construction of the railway, human skeletons wrapped in bark and accompanied by beads and ornaments, were exhumed and destroyed by the navvies engaged in the work. But we have no reason to believe that the mountain or its surroundings were materially different then from what they are now, except as regards the removal of the forests and the changes incidental to the advent of civilization. So we have no reason to anticipate any serious change in the future. The volcano, if we are right in so terming it, is dead, and has been so for many millions of years. Volcanic activity has been transferred to other regions of the earth, and Curries Mountain and its associated hills are now chiefly interesting as helping to determine a beautiful landscape or as affording to the geologist opportunity for the study of some problems of the remote past.

