FIRST REPORT

ON THE

GEOLOGICAL SURVEY

OF THE PROVINCE OF NEW BRUNSWICK.

By Abraham Gesner, Provincial Geologist, &c.

General Remarks.—The rocks composing the crust of this earth may be properly divided into two great classes. One of these classes has had its members formed by heat, which, having acted under a great variety of circumstances, has produced results in some degree dissimilar to each other; but as it has always fixed the most important features of certain rocks, the geologist is able to recognize each number of the class with some degree of facility. Granite, syenite, greenstone, and pophyry, belong to this division, and are intimately connected with the more recent productions of basalt, and trap, which agree in their texture and composition with the lava poured forth by volcanoes now in operation. These compact and crystalline masses of mineral matter, have from time to time burst forth beneath and overspread extensive portions of the earth.

The other great class of rocks has been derived from the disintegration, and decomposition of older formations, and by the action of water has been spread out in many different layers at the bottom of ancient oceans, seas, and lakes. In this way stratum after stratum has been collected, until they were elevated to form dry land. The members of this divison are readily distinguished from rocks of an igneous origin, by being separated into strata piled one upon another, and like the different masses of stone placed by the skill of the architect, they form an edifice exhibiting the most perfect order and regularity. The materials of each stratum have been taken from pre-existing rocks, accumulations of vegetable matter, swept from the surface by floods, and the solid parts of marine lacustrine,* and terrestrial animals; hence the variation in their ingredients cannot be surprising, as the fluctuations and changes in the causes that produced them were evidently numerous. These different mechanical deposits are separated by geologists into distinct groups or formations, according to the kind of matter they contain, or the races of once living animals now sealed up in their impenetrable vaults.—It is only by consulting extensive geological treatises, that even a theoretical view of this subject can be obtained, and the order of superposition understood. A practical acquaintance with the science not only requieres a knowledge of almost every branch of natural history, chemistry, and mineralogy, but an actual inspection of each mountain mass, and sections of the deepest mines.

Coal, and the most important of the metals are only found under certain kinds of rocks, therefore the importance of such knowledge is manifest, for the practical geologist can discover at a distance, by the altitude and configuration of mountains and hills, what rocks they are composed of, and he knows what minerals those rocks are likely to contain.

Having obtained in the summer of 1837, an outline of the geological features of that part of the Province which borders upon the Bay of Fundy, and commenced an examination of a section of the country extending from Magaguadavic to the Gulf of St. Lawrence, I was not unprepared to enter upon a more particular investigation of the district to which my instructions referred, and the labours of the past season have fully confirmed opinions expressed in letters I had the honor to address to your Excellency, previous to my appointment to commence a general survey.

The south coast side of New Brunswick, or that part which reaches near the cost, extending from Shepody Bay in the County of Westmorland, to the American boundary line in the County of Charlotte, is occupied by an extensive and moderately elevated range of mountains, composed principally of granite, and other primary rocks. This range is situated at an averaged distance of fifteen miles from the shore of the Bay of Fundy, and includes the highlands eastward of the River Saint John. Westerly, it embraces Bald, Eagle, Douglas, Pleasant and other mountains. The course of this mountainous district is from the south west to the north east, the general direction of all the principal formations in North America.

At the south eastern base of this elevated region, the slates and limestone of the transition series, and the sandstones and conglomerates of the secondary formations, are placed in their usual order of succession, wherever they have not been broken up, and buried by extensive eruptions of volcanic matter. All these rocks have beeen penetrated by large and numerous dikes of trap, basalt and pophyry, and the surface of the country with all the islands in the Passamaquoddy Bay, exhibit the clearest evidences of having been the theatre of violent earthquakes, and intense volcanic action.

The granite entering into the structure of this mountain chain, is also succeeded on its northern side by slate and greywacke; these have been examined as far westerly as the Meductic Falls. Then follow the rocks of the great coal formation, which extends from the head of the Oromocto river in a north east direction to Northumberland Straits, a distance of one hundred and twenty geographical miles. —This is one of the diameters of the New Brunswick coal field, which ranks amongst the greatest ever discovered. Only a limited portion of this coal region has yet been explored, but in future examinations its boundaries will be defined, and its importance to the Province more perfectly explained.

Each of these formations, and the minerals they contain, will be described in the order in which they were examined, this general outline having been given to assist the memory.

The transition and secondary rocks on the north west side of the primary chain already mentioned, are placed in conformity to the order in which they are observed in England and other countries, and they do not appear to have suffered much by forces acting upon them after the position of each formation had been fixed. Not so with the groups of strata situated along the coast; after these had been laid in their general situation and position as they are found elsewhere, they were displaced, the strata broken up and elevated, and both their chemical and mechanical characters changed by heat, and other agents applied under the most intense energy of subterranean power.

Perhaps to some, such declarations may appear to assume too much, and to have been drawn from theoretical views, rather than practical inferences; but the circumstances justify the most unequivocal mode of expression, and the facts unconnected with any theory have been honestly and faithfully recorded. Whoever beholds the south eastern side of the Province cannot fail to observe the lofty mountain, the vertical cliff, the foaming cataract, the rude outline, and other sublime features of the district; nor need he hesitate to attribute to the earthquake and the volcano, the contrast between this and the great coal region, where a more tranquil course of changes has marked both the mineral, and agricultural character of the country.

It has been observed by geologists, that the proximity of the sea is a necessary condition of the existence and continuance of volcanoes. If the intense heat of the crater, and its overflowing lava, are the the results produced by water coming in contact with the bases of the metals, and a consequent chemical re-action of all their united forces, it is readily explained why both ancient and modern volcanoes are formed upon the margins of oceans and seas. It may be remarked, notwithstanding, that in the great volcanic band of the Andes, some of the craters are placed at a great distance from the ocean, the presence of which, in these cases, does not seem to be necessary to produce the fiery deluge ever rushing from their lofty cones. But a sufficient supply of water may be placed in subterranean reservoirs to feed the hidden laboratory.—The trap rocks of Nova Scotia and New Brunswick, although by no means of recent origin, are placed along the shores, and the interior of the country bears not the marks of those violent eruptions which have taken place along the coasts. It is true there are none of those splendid operations now going forward in North America, and the inhabitants rest free from the terrors of the earth's furnace, and the dismay of the sulphureous deluge; but many rocks bear the clearest evidence that such phenomena have existed even here, and the shocks of earthquakes felt from time to time, loudly proclaim that their causes are not altogether removed.

To ascertain the limits of any of the formations of New Brunswick is often extremely difficult, on account of the loose beds of *detritus* frequently covering the rocks to considerable depth, and as much of the surface is still in a wilderness state, and rendered at some places almost impassable by decayed trees, and a thick growth of underbrush, much labour is required under these circumstances to collect such facts as are necessary to describe the situation and position of the rocks beneath. If, therefore, any inaccuracies should appear in regard to distance, and the exact situation of particular minerals, they are such as could not be avoided under the circumstances, and they are not such as can materially retard the progress of any practical object.

It will be observed that my instructions directed me to commence the geological *reconnissance* in that part of the Province which extends southward and westward from the river St. John to the Bay of Fundy, and the American boundary line on the St. Croix, including the British Islands in Passamaquoddy Bay. This tract embraces the County of Charlotte, and parts of other counties that intersect the river. The examinations were commenced on the coast and islands, and thence extended to the interior of the country.

CHARLOTTE COUNTY.

Saint Andrews.—Saint Andrews is situated upon a peninsula on the east side of the mouth of the Scoodiac or St. Croix, which at its entarnce is two miles wide. The peninsula is four miles long, and is composed of new red sandstone, covered with beds of clay, gravel, sand, and marl. The sandstone also forms Navy Island at the entrance of the river, and extends in a westerly direction into the American State of Maine. The course of this formation is from the north-east to the south-west; the general dip of the strata is to the south- east, as an angle of 15 from the horizon; but wherever the rocks are intersected by dikes of trap, the angle is often much increased. At several places this sandstone was observed to be underlaid by thin strata of conglomerate, which belongs to the same formation. The upper strata of the rock is wariegated in its colours. Some of them are soft, marly, or slaty, resembling red shale; others are more compact, and will afford good free-stones for building. These circumstances of themselves distinguish the rock from the old red sandstone, which is of an uniform dull brick red colour, and more coarse and granular in its texture. In an easterly direction this red marly group extends five miles from the town, and is met by rocks of an igneous character. The sandstones of this formation are composed of small particles of quartz mixed with mica, cemented generally with the oxides of iron. The streaks of different colours led the celebrated Werner to denominate the formation "*Bunter Sandstein*," variegated sandstone. Wherever the mica is abundant, the rock becomes slaety, as the scaly particles of that mine are always placed with their lamiæ parallel to the lines of stratification. This circumstance is also evidence that the rock was formed by water, which, by its currents, always throws down substances of every kind upon their broadest surfaces. It has been remarked that the red marl group of England contains no organic remains, except the magnesian limestone which is associated with it. The members of this group appearing at St. Andrews contain numerous relics of marine plants. Among them one was found resembling the *Laminaria Saccharina*, or common kelp, still growing abundantly along the coast. Scarcely an atom of the original plants can be said to remain, but the situations which they occupied after the materials of the rock had been deposited, have been filled up, and perfect casts of the original still mark the places where they ceased to live.

Among the lower members of this group, the sandstones approach in their character those of coal formations, and the charred remains of land plants were discovered among them. From this and other circumstances, it was hoped that some sure indications of coal would appear, especially as they would be matter of great importance in a part of the country where verey circumstance connected with the transportation of that mineral is very favourable.

In order to ascertain this point, it cost me much time and labour to determine if these rocks were connected with the great coal field of the Province; but since my last visit to Saint Andrews, I have discovered that they are separated from the great coal dictrict of the country by distance of many miles, and mountainous chain already described. It may, however, be probable that coal exists near Saint Andrews, but the difficulty of ascertaining its situation, is great under all the circumstances, and much capital might be lost before the facts necessary to successful mining could be known.

The conglomerate is made up of rounded masses of older rocks, firmly consolidated by calcareous and silicious particles. The strata resemble mortar, in which pebbles from the size of a walnut to that of an orange have been mixed. Each of these rocks have had their strata intersected by numerous and extensive masses of trap rock, which frequently extend in parallel ridges to the distance of several miles, and may be followed to the highlands situated north-wardly, from which they branch off in all directions, decreasing in their altitude according to the distance they depart from their parent mountain.

At "Joe's Point," and near the ferry from Saint Andrews to Robbinston, there are two dikes of trap, each about fifty yards wide, and the elevation they have produced is distinctly marked upon the surface to a considerable distance. They are seperated about a furlong by a coarse conglomerate, which is overlaid by one of them in a remarkable manner. It appears the matter forming the dike having filled the cavity it now occupies, overflowed the opening, and now covers the rock through which it passed, to a distance of several hundred yards. This fact reminded me of having seen the liquid lava pouring over the sides of the volcano at St. Lucia.

The trap rocks of the "Point" contain narrow veins of calcareous spar; in one of these veins, a small quantity of the green carbonate copper was found, but during an accurate examination of every rock near the place, no further indications of that mineral were observed. Wherever the sandstone is found in contract with the trap rock, it is filled with small empty cavities, and resembles the cinders of an iron foundry. But when these cavities are found in situations where the air has not had free access, they are filled with the carbonate of lime, and semiopal, and the rock becomes amygdaloidal. The empty cells are produced by the ready decomposition of the minerals contained in them, and wherever the volcanic rock meets the sandstone, amygdaloid is generally formed —a fact also observed in Nova Scotia, and in England. It appears that the cellular structure of lava, and scoria, arises from the presence of air, when those volcanic productions are in a liquid state, and not from small collections of gases, as some have supposed. These openings have evidently been filled by mineral infiltration, after the ejected matter had become consolidated.

Four miles northward and eastward of Saint Andrews, the Chamcook mountain rises near the entrance of a river, and the exit of a lake, bearing the same name. The most prominent part of this mountain is 580 feet, trigonometrical measurement, above the level of the sea. It is composed altogether of trap rock, and marks the boundary of the sandstone which lies along its base, forming a wide, level, and fertile plain, with a harbour on each side, and a beautiful town at its extremity. From its summit, this pretty view, Moose, Deer, and several other Islands, scattered in Passamaquoddy Bay, Robbinston, and other villages of Maine, Saint Stephens, and the winding Saint Croix, afford a wide, varied, and pleasing landscape. In a northerly direction, the volcanic rocks are piled in naked mural precipices, which appear to have burst through the red marly group, and carried its broken strata even to the pinnacles of the highest cliffs.

The soil in the neighbourhood of Saint Andrews is very fertile, wherever it has been derived from the decomposition of the sandstone; the beds of clay and gravel are less productive, and would be much improved by the application of marl or lime. The former substance having been found here, will be particularly described when the tertiary deposits are brought under consideration. But it would not be just to proceed farther before noticing the existance and usefulness of a Geological Society, formed in the town. This Society embraces a number of the most erspectable and scientific gentle men of the County. Already a considerable number of specimens have been collected, and some of the members are making rapid advances in geological science. To them I am much indebted for assistance and information, and it is ardently hoped their labours may be as gratifying to themselves, as they must ultimately prove useful to that portion of the Province.

(To be continued next week.)

* Lacustrine—belonging to a lake.

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