

phenomena attending their future state, their organic remains, &c. may exercise the reasoning powers of a future race of mankind.

*Remarks on the DISTRICT traversed by the
ST. MAURICE EXPEDITION, in the Summer
of 1829, by Lieut. INGALL, 15th Regt.*

THE intention of the few following pages is to give a concise account of the component parts of the rock and soil forming the shores of the rivers and lakes explored, and to establish the probability of the same formation extending over the intervening area.

The impossibility of ascertaining the agricultural resources of a country, from merely passing up a river, is a very prevalent opinion, and one that would in the main be just, were the ascent pursued in a direct line, for it does sometimes occur that the shores of a river are low and covered with sand for a considerable distance back, although on further examination, the soil may be found to improve and the timber become of a finer description: but by making lateral excursions up smaller streams and closely examining the rock and soil on their shores, a pretty correct judgement of the country forming the area between those streams and rivers may be arrived at.

From the great sameness prevailing in the primitive formation met with on the route pursued, but little can be said on the rocks constituting the range which divide the waters flowing into Hudson's Bay and the River St. Lawrence, except accurately describing their occurrence ; but it will be necessary to bring before the society one concise and general view of the country bordering the Rivers St. Maurice and aux Lievres, and also on the great chain of lakes lying between those two rivers ; in order to prove the probability of the area comprised within their limits being of the same primitive formation, and covered with the same description of silicious sand, as that found constituting the shores of those waters.

At Three Rivers there exists an alluvial deposit of silicious sand extending about nine miles to the northward, forming a moderate sized hill on the south side of the St. Maurice. This hill abruptly terminates at the village of the Forges, and a lower and more level track stretches several miles farther to the north. This flat, although lower than the hill, is considerably higher than the river, and contains one or two extensive swamps ; but the soil is of the same silicious sand as that found at Three Rivers.

Near the Gabelle Rapids, and on the south side of the river is a formation of limestone, containing embedded organic remains. At the Rapid Grais this limestone gives place to a sandstone, apparently fit for mill purposes : both these formations rest on the sienitic rock which forms the bed of the river. Where the sandstone terminates are large deposits of white clay bearing a thick covering of silicious sand. This clay ceases a little above Pigeon Island ; and excepting at the Portage of the Shewanahegan,

and on the north shore near Cape le Blanc, where a small deposit of clay again makes its appearance, nothing but a light silicious sand is met with, resting to various depths on the primitive rock, as far as Wemontachinque.

In some places, particularly at the lower Caribou Mountain, and immediately above Rat River, the sand hills are from eighty to upwards of one hundred feet in height.

On the west side of Lake Manjeamagouth, a bed of clay is again found stretching towards the south; and this clayey deposit is fallen in with on the middle and lower parts of the River aux Lievres.

The sienitic rock which is found as low as the Grais Rapids, and probably extending below the Gabelle, contains a little black mica, but not sufficient to alter the character of the rock. On the shores are immense bowlders of quartz, containing abundance of common garnet, in some respects similar to the manganesian garnet, and possibly owing their violaceous hue to the presence of oxide of manganise.

At the junction of the Shewanahegan with the St. Maurice, we observe that remarkable subsidence of the land which forms the extensive basin, receiving the waters of the St. Maurice and Shewanahegan in one blended stream. On the north side of the basin is the almost perpendicular precipice of sienite, down which rush the waters of the St. Maurice in two separate falls, the river being divided by an island nearly a quarter of a mile in width. These falls are estimated at one hundred and fifty feet in height. At the foot of the precipice lye confusedly heaped together the debris of the rock, and opposite on the north shore are large blocks of a similar garnet-rock, as that before described at the Rapid Grais; except that they contain a very

small quantity of mica in thin layers. It is not improbable that the waters of the St. Maurice, may in time, force for themselves another channel through the clayey neck of land, over which now runs the portage, and thus form a third fall to the southward of the other two, and nearer the Shewanahegan River.

Another subsidence in the bed of the river occurs at the falls of the Grande Mere, about eleven miles above the Shewanahegan. These are near sixty feet in height, and pour over a rock of sienite, forming at their foot a similar basin and nearly of the same extent as that at the Shewanahegan. Here the river, in its course to the St. Lawrence, takes a turn almost at right angles; a circumstance common at all the falls and most of the rapids, not only on this, but many other rivers.

The rock from hence as far as Cape le Blanc, a high perpendicular precipice near seven miles higher up the river, continues to be a sienite with hornblende in excess; but at that Cape the hornblende diminishes in quantity, and the quartz and light red felspar occur in large sized crystals. This rock is much stained with the oxide of iron, particularly near the summit. Immense fissures intersect the rock in various directions, and bear evident marks of the excessive violence of that awful concussion which has thus torn asunder large mountains.

The sienitic formation continues without intermission as high as Wemontachinque. Occasionally, and for a short distance, it passes by regular gradation into gniess and very coarse granite, frequently containing crystals of garnet.

Large blocks of red felspar were seen lying on the shores of the river and embeded in the rock in situ.—

Sometimes from the total absence of mica and hornblende the formation consisted of only two simple crystalline minerals, quartz and felspar, occasionally containing large masses of pure rock-crystal; and in one or two instances small portions of common magnetic iron ore.

On the River Nawartnoo, above the falls of Kanowdy, which lie some miles to the west of Rat River Post, the rock parts with its hornblende for some distance, and the place is supplied by small specks of black mica, and a little shorl. On the east shore of one of the lakes in this neighborhood, there occurred some common magnetic iron ore.

At the upper end of one of the small lakes of the Coo-coo-cash, communicating between the Rivers Vermilion and St. Maurice, was a strong chalybeate spring running through a bed of ferruginous clay, leaving a thick deposit of oxide of iron. This stream seems to pass under a bank of gravel and coarse sand about thirty feet high, and two hundred and fifty feet wide, dividing this lake from another.

At Wemontachinque, and some other parts of the river, the rocks frequently contain small embedded crystals of deep red garnet; and sometimes was observed a compound rock of considerable extent, composed of common quartz, small crystals of flesh-red felspar, mica, hornblende and minute crystals of garnet. On the north shore of lake Malowin, we noticed crystals of iron glance and shorl embedded in coarse granite; these minerals we occasionally met with on other parts of the route.

About fifty miles above Lac du Sable on the River aux Lievres, is first seen a formation of calcareous spar. This rock occurs in small rhomboidal crystals, closely aggregated, its external structure much resembling tabular spar.

A vein of granular limestone nearly approaching in appearance to dolomite, runs through the calcareous formation, which is also intersected with broad veins of quartz and hornblende. This hornblende in many instances is vesicular, the vesicles filled with crystals of calcareous spar; there also occurred masses of quartz, containing nodules of the calcareous rock. At one place was observed a broad vein of epidote, running through the calcareous spar with an upper strata of quartz resting upon it; thin veins of calcareous spar passed through this epidote.

We occasionally fell in with the calcareous formation, until we reached Lac du Sable, where we again noticed it on the north shore, underlying a rock of light grey limestone containing in its composition an admixture of silicious matter, and some small orbicular crystals of milk colored quartz. These rocks are situate close to the edge of the lakes and rising immediately above them is a hill of sienite thinly covered with sand. The sienite is of a dark color, apparently stained with the oxide of iron.

Between Lac du Sable and the River Ottawa, we alternately fell in with the calcareous spar, and sienite, the hills being invariably composed of the latter. At the foot of the Cedar Portage, a few miles below Lac du Sable, the calcareous spar occurred, forming the bed of the river, but intersected with broad veins of silicious limestone, abounding in large crystals of talcy mica and white iron pyrites. The portage, which is rather above the level of the river, runs over a rock of sienite. About ten yards from the west shore rises a small hill of sienite, about two hundred feet in circumference, covered with moss and trees: the channel between it and the main shore consists of the calcareous spar, abounding with mica; near the

summit of the hill, about twenty feet above the water-mark, was procured a specimen of what, at first, appeared to be fluat of lime, but upon examination we have reason to believe it to be azurite. Immense quantities of apatite (phosphat of lime) was aggregated in veins, running through the calcareous spar, which formed the dry channel between the small sienitic hill and the main land.

On the shores of the "Little Lake of White Fish," about half a mile to the west of the post near Lac du Sable, and also on the shore of the "Great Lake of White Fish," to the southward of the post, were noticed large blocks of calcareous spar, containing small portions of carburet of iron. In one block, from which a specimen was procured, were found crystals of epidote. The portages leading to these lakes ran over hills of sienite.

At the foot of the Mill Portage, three or four miles above the Ottawa, the rock consists of red felspar, of an earthy appearance, with quartz and specks of serpentine. Overlying this rock is a broad vein of calcareous spar containing some carburet of iron.

In the vallies lying between the broken ranges of hills, are found deposits of silicious sand to great depths; but on the tops of those hills the covering of sand is scanty.—Where the beds of calcareous spar occur in the vallies, a different species of timber is generally found, from that covering the sides and summits of the adjacent mountains. In no instance, except near the Gabelle Rapids on the south side of the River St. Maurice, was seen the slightest trace of fossil organic remains; nor could the closest scrutiny discover among the sand, any fragments of shells; but in all the lakes were abundance of the genus *mya*.

The vast chain of lakes found on the lands height, and

constantly supplied, not only with living springs, but by the melting of the great quantities of snow which fall in these regions, find their outlet through the vallies occasioned by the dip of the mountains towards the south and S. S. W. and meeting in their course with the extensive basins formed by the subsidence of the rocky strata, spread themselves over the hollows; thus constituting the smaller lakes, which cover nearly one-third of the country lying between the lands height and valley of the St. Lawrence. These lakes discharge themselves by innumerable shallow streams, into the St. Maurice and aux Lievres Rivers, and ultimately blend with the waters of the St. Lawrence; in one or two instances the streams swell into large and rapid rivers and discharge into the Ottawa and Lake St. Peter in a direct course. The beds of all these lakes and rivers are of primitive formation, usually covered with sand, the debris of the neighboring rocks. Some of the lakes explored, were evidently once of much greater extent; while on the other hand some are annually encreasing in size, by the spring floods carrying away portions of their sandy banks.

On the summits and sides of the hills were seen immense angular fragments of rock, their edges but little worn; many are thickly covered with moss. These fragments lye embedded in sand; and doubtless owe the origin of their present situation to that great internal convulsion which has caused the stupendous precipices, so frequently seen in these mountain lands.

At what period this catastrophe took place it is not now easy to conjecture, whether at the retiring of the great waters which once covered this continent, or whether it was the effect of some subsequent earthquake, can be of no

immediate consequence to our present object to determine; our only desire is to point out the positions in which those rocks are found, and the nature of the materials of which they are composed.

Having thus given a summary sketch of the rocky strata, it becomes our next business to describe the general direction of the mountain belt now under examination. At the falls of the Shewanahegan the mountain formation may be said to commence. This range runs in a direction towards the River Ottawa; and from all the information obtained, passes between the Lake Masquinongé and the River St. Lawrence; running a few miles in the rear of Montreal, until it joins those hills which branch off near Grenville towards the east north-east. The country lying at the foot of these hills, between Three Rivers and the Ottawa extending to the River St. Lawrence, as well as that flat district forming the north shore of the Ottawa from the mouth of the River aux Lievres to the Lake of the Two Mountains, is, generally speaking, a good description of land, and bears fine timber. In this vast extent of low land, are found horizontal beds of limestone, containing remains of organized beings; and in some places there exist beds of a yellowish loamy clay. A great part of this tract is strewed with bowlders of various sizes; consisting of sienite and sienitic granite, similar to the rocks which form the hilly barrier to these low lands. The bowlders being found scattered over the stratum of secondary limestone is in unison with what Professor Buckland met with in many parts of Europe; and their occurrence in America is quoted by that able geologist as a confirmation of the fact, that the habitable portion of the world, in all quarters, has undergone a second and very recent general

deluge, certainly from the circumstance of these boulders being commonly found lying on the secondary limestone, and the great size of many of them, it would appear that a body of water more powerful in its effects than the mere overflowing of a river, must have been the agent employed in conveying them to their present position :—and in this district there is abundant evidence of those waters having retired through the two great vallies of the Ottawa and St. Lawrence, of course subsequent to the deposit of the secondary strata. But to resume our description of the mountain range.

From the Shewanahegan falls, a hilly country continues to form the shores of the St. Maurice as high as Wemontachinque, with occasional intervening vallies of sand. In general an alluvial sandy flat extends from the foot of the hills to the margin of the river, varying in width.

By ascending the chain of lakes running in rear of Rat River Post, towards the westward, and branching off to the N. E. towards the River Vermilion, we ascertained the existance of the same primitive range as that forming the shores of the St. Maurice, and covered with a similar silecious sand. As far as the eye could command a view towards the west and south-west, we observed broken ranges of hill, generally dipping towards the St. Lawrence. On ascending the River Vermilion we again distinguished the same description of hilly country extending to the south-west for a considerable distance. On our right hand was a corresponding formation stretching to the east and north-east beyond the shores of the St. Maurice. Frequently the hills were fractured in an awful manner, exhibiting the bare and rugged front of stupendous perpendicular cliffs, several hundred feet in height. The summits of

these cliffs are covered with sand, and at their feet lay the large angular fragments of the rock, their angles slightly worn by the action of the air. From out of the crevices of these fallen masses grew small sized spruce, birch and poplar trees. One of these precipices, near a mile in length, was particularly remarked on the portage to Black Beaver Lake; and another was noticed near the Great Lake of the Coo-coo-cash, in a direction nearly south and east.

From the Coo-coo-cash to Wemontachinque, we could distinguish, on the west shore of the St. Maurice, similarly formed hills, with occasional precipices reaching far to the westward.

From Wemontachinque we crossed in nearly a direct western course, to the River aux Lievres. Our route generally lay at the northern end of the lakes which overspread the vast basins formed between the spurs of the mountains. These spurs have an almost uniform direction to the S. S. W.; although occasionally small ridges were seen to run in a contrary direction. Some of the lakes afforded an opportunity of examining that portion of the country seen from the River Vermilion: invariably it appeared to possess the same features as those portions we were traversing. It may not be unnecessary to remark that this chain of lakes lie in the mountain ridge forming a part of the lands height.

At length we descended the River aux Lievres in a generally south direction, and observed the mountain lands extending to the south and S. S. E., also on our right hand towards the north-west. In the descent of this river which wound its tortuous course through the vallies formed by the broken ridges of hills, we were again struck with the

appearance of immense inland precipices of sienite, fractured in the like extraordinary manner as those seen on the rivers and lakes explored in the first portion of the journey. At Lac du Sable we could clearly distinguish that the country to east and south-east was hilly and broken, and it was found the same for a distance of twenty miles below that lake. Here a subsidence in the rock occurs and the river falls over a precipice of about one hundred feet in height. From hence the hills appear to stretch more to the E. S. E. and we lost sight of them altogether a few miles below the falls; and the east shore of the river from thence, in general consisted of a flat sandy tract spreading in a direction towards Grenville.

About nine miles above its junction with the Ottawa the aux Lievres rushes over a bed of sienite, forming a series of splendid falls and rapids, surpassing in picturesque beauty, any thing of the kind we had before seen.

On the north shore of the River Ottawa we again fell in with the mountain range running parallel with the river in a south-east direction. These hills varied from several miles to a few hundred yards distance from the water side. Near Grenville this range appears to run towards the E. N. E. in a direction (as before stated) to join those hills which branch off from the River St. Maurice. It is between this mountain line and the St. Lawrence and Ottawa that the limestone formation is met with, covered with a good soil bearing fine timber. The principal places where the secondary strata was seen, were Grenville, on the Ottawa, and near the Gabelle Rapids on the St. Maurice; it is also known to exist at the back of Montreal.

Having thus shewn that the primitive range of hills, covered with sand extends far into the interior from the

Rivers aux Lievres and St. Maurice; that it also dips deep to the southward from the shores of the great chain of lakes lying between those rivers; and that it runs parallel with the Ottawa as far as Grenville, from whence it joins the chain extending from the Shewanahegan; we think it can scarcely admit of a doubt, but that the whole extent of country lying within that area, is of the same primitive formation covered with a siliceous sand, as that which constitutes the mountain belt already described.

Were it necessary we could adduce many instances of a country similarly formed. We particularly remember one in Devonshire, England; in the district locally called the South Hams: this tract of country lies between the sea and the Dartmoor Hills, and is remarkable for its fertility.—About fourteen miles from Exeter is a flat called Bovey Heath, famed for the submerged wood, or Bovey coal.—This heath consists of an extensive bed of pipe-clay overlying the wood coal, and covered with a deposit of sand which forms the upper surface; if we except the thin layer of peat earth, the gradual accumulation of ages. Numerous flint quarries are found on the surface abounding in organic remains.

This extensive level is situated at the foot of the Dartmoor Hills, about five miles distant from the sea coast, and the intermediate space is occupied by a hilly country called Haldon, partly formed of sandstone and partly of lime rock, covered with a rich red loam.

The whole extent of the South Hams is about forty miles in length and of varied width, lying, as above observed, at the foot of a range of barren hills, and bearing a striking resemblance, in many of its most important features, to the country lying on the borders of the St. Lawrence and

Ottawa. It is likewise well known that the interior of the Dartmoor Hills, is equally barren as the external ridge, corresponding in that respect, with what we have endeavoured to prove as being the case, in the regions now under notice.

It only remains to say a few words on the agricultural nature of the soil prevailing in the district explored. The sand which has been mentioned consists of minute crystals of quartz, felspar of different colors (generally white or red), with, now and then, a small portion of hornblende, or mica, but no garnets except in the recent deposits round the shores of the lakes. The felspar sometimes occurs in a state of decomposition. This sand is mostly covered with a very slight layer of vegetable mould.

Sand, by itself, is well known as the very worst description of soil that can be met with, and totally unfit for agricultural purposes. From its loose silicious nature, it allows water to filter through it, and soon becomes dry; consequently the seeds, which have germinated while the soil was wet from the spring showers, become parched up, and perish during the summer heats. But sand mixed with calcareous earth, becomes more tenacious, and retains moisture for a greater length of time. On the other hand, if sand is mixed with clay, it renders it more loose, each correcting the faults of the other,—the sand by itself not retaining sufficient moisture for vegetables, and clay not allowing the small fibres of their roots to expand freely in search of nourishment. It must also be remarked, that a calcareous soil (like one composed entirely of sand or clay) is not in itself a good soil, but only so in proportion to the degree with which it is mixed with decomposed vegetable matter,

This we found fully exemplified in the beds of calcareous spar lying in most of the vallies in the lower parts of the River aux Lievres, where, owing principally to the deciduous nature of the trees, the vegetable mould occurs to a greater depth.

The decomposed particles of this calcareous rock, blending with the sand, has improved the soil so much, that it gives nourishment to a finer description of wood than is seen on the mountain heights; but still vastly inferior to the timber found on the alluvial deposits of rich land reaching from the foot of the mountains to the shores of the Ottawa and St. Lawrence.

When lime is mixed with clay (which constitutes marle) it is highly useful in the decomposition of decaying vegetable substances; hence its presence is necessary in the decayed animal and vegetable matter, which forms the upper stratum in the forests of America. It is ascertained that a very small proportion of vegetable mould is necessary to form a calcareous strata into good soil, as is sufficiently proved in the numerous instances of sand abounding with fragments of shells, bearing fine crops, with scarcely any covering of vegetable earth. From nearly a similar cause, the timber on the lower parts of the aux Lievres is so much finer than on the shores of the St. Maurice, or Great Lakes, where no calcareous spar made its appearance.

Yet after all the depth of vegetable mould is of primary importance; and in this particular the district in question was miserably poor, for it was rarely a strata of mould was found more than half an inch in depth and frequently not so much. This is to be attributed to the peculiar nature of the spruce and other trees of the pine species not being deciduous:—but where the young groves of birch and

poplar abound, the annual accumulation of their decayed leaves, mixed with the putrid remains of the myriads of insects and animals, all of which assist in the decomposition of vegetable matter, a thick and rich strata of earth, closely resembling, what by horticulturists, is termed garden mould, will in time be formed. But even in the richest districts of Canada we find the virgin soil soon become exhausted, and requiring an admixture of calcareous matter to assist in the decomposition of the stalks and other remains of vegetables it has formerly borne. It is well known that vegetables buried in a green state, remain in the ground inert for a greater length of time than when mixed with some more active decomposing matter.

At the posts of Rat River, Wemontachinque and Lac du Sable, where a portion of land has been some years in cultivation, the soil is nearly exhausted; so much so, that out of a large field of Indian corn which was sown two years since, at the first mentioned post; not more than twenty stalks have made their appearance, although the seed was said to be excellent. At Lac du Sable the corn bore only one ear on each stalk: and all other vegetables, (except pease,) have yielded but poor crops for the last two or three years; however, by a judicious application of lime the quality of the upper surface may be restored.

Unfortunately the prevailing timber in these sandy regions being evergreen, the accumulation of vegetable mould must of necessity be remarkably slow; and an incalculable period will elapse, ere the land in this district can be fit to receive the needy settler who depends upon the produce of his land alone, for subsistence.

We now beg leave to conclude, only regretting that a limited experience prevents our treating this interesting

and important subject with the science it deserves; and resting in hopes that some future explorer will throw a more beneficial and instructive light on this branch of agricultural geology, as far as concerns the interior of this Province.

*On some PROCESSES in use among the HURON
INDIANS in DYEING, by W. GREEN, Esq.*

Among the Hurons of Lorette, the females exclusively practice the art of dyeing.

The substances which are the subjects of their art are chiefly porcupine-quills, elk-hair and leather.

Their *red* is extracted from the root of *tsa-voo-yan*, (*galium*). The spike which consists of the seeds of the sumach with their pericarp and the stalks to which they are attached, are washed in cold water to clean them. They are then boiled in soft water. When this water has become of a deep brownish red, it is strained through flannel. The root of *tsa-voo-yan* pulverized is infused in the sumach water. The porcupine-quill or elk-hair is then introduced, and the temperature gradually raised to the boiling point, and there sustained a quarter of an hour. It is then taken out and rinsed in soft water, and then it is soaked for a short time in weak soap and water. It is then washed in pure water warm. The red thus dyed is a deep scarlet and durable. For lighter tints the time

of infusion is shorter. The subject is then wrapped up in flannel and dried. When so dried it retains its roundness. Had it been dried in the open air, even without light, it would have become flattened and contorted.

Their *yellow* is of a pure hue, rather pale and very durable. The seeds of ootsigooara oookwa, (*myrica gale*,) are pounded and mixed with water, and boiled for a quarter of an hour. The porcupine-quill or elk-hair is then introduced and the ebullition continued for another quarter of an hour. It is then withdrawn and washed in soap and water and then in pure water. It is then dried with the precaution mentioned in the former case.

Their *blue* is extracted from green baize. The baize is boiled in pure water. When the water has become of a deep blue the subject is introduced together with a little alum in powder. They are then brought to the boiling point, and the boiling is continued a quarter of an hour, when the subject is washed in pure water. It is *essential* that the baize be old, or have been much worn. It then retains its yellow and parts with its blue in this process. But if the stuff be new, it parts with both these colours. The blue dyed by the Indians of the interior is deeper than the above, and is said by the Hurons to be derived from indigenous plants, no longer known to the latter.

Green is dyed by boiling a subject previously dyed yellow, as above, in the blue decoction above described.

Brown is dyed with the husk of the butter-nut, (*juglans cathartica*.)

Black, with the husk of that nut, or with the bark of alder or of maple, with sulphate of iron. If with the first the black inclines to brown, if with the second it is purplish, and bluish with the last.