

GEOLOGY.

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SKETCH OF THE GEOLOGY OF CANADA.*

The geological formations that have been ascertained to exist in Canada are: 1st, the Laurentian system; 2d, the Huronian; 3d, the Palaeozoic rocks, from about the base of the Silurian upwards to the base of the Carboniferous; 4th, the Glacial Drift. Of each of these it is proposed to give a short description in the following sketch.

1. *The Laurentian System.*—It is estimated that at least 200,000 square miles of the northern and central portions of Canada are occupied by the Laurentian rocks. They spread over nearly all the country north of the rivers Ottawa and St. Lawrence, and also over the greater part of the region lying between the Ottawa and Lake Huron. From this last-mentioned tract they extend in a southerly direction to the St. Lawrence, between Kingston and Brockville, and are continued into the State of New York. The boundaries of the formation will be more particularly defined in the description of the Palaeozoic rocks.

The Laurentian system consists of many varieties of gneissoid, quartzose, and felspathic rocks, interstratified with beds of white crystalline limestone, and dolomite, and rich deposits of the magnetic and specular oxides of iron. These rocks are distinctly stratified, and are no doubt of aqueous origin, having been accumulated in a sea vastly more ancient than that of the Silurian period. No fossils have yet been found in them; but as they are in a highly altered condition, it is possible that they may have at some time contained an abundance of organic remains, which have been obliterated while the rocks were undergoing the process of metamorphism. The strata appear to have been subjected to many great convulsions, as they are usually tilted up at various angles, bent, broken by faults, and greatly confused. They are very evidently older than the Lower Silurian, it having been ascertained that not only does the Potsdam sandstone rest upon them unconformably, but also that the Huronian rocks in the neighborhood of Lakes Huron and Superior are interposed between this sandstone and the Laurentian.

2. *The Huronian System.*—The Huronian formation is known on the shores of Lakes Superior and Huron where it attains a thickness of about 12,000 feet, and is seen to pass beneath the Lower Silurian, while it reposes upon the Laurentian. It is therefore newer than the latter, and older than the former. This system of rocks consists of a series of schists, sandstones, limestones, and conglomerates, interstratified with beds of greenstone, and holding those deposits of copper ore which have made that part of Canada a mining region.

In addition to the copper, other metals, such as silver, nickel, cobalt, lead, and gold, have been found in small quantities. This formation has as yet yielded no fossils, although it is for the greater part a stratified, sedimentary deposit. It has been traced for a distance of 450 miles along the shores of Lakes Huron and Superior, and stretching northeast to Lake Temiscamingue.

3. *The Palaeozoic Rocks.*—Reposing upon the two above-noticed formations, we have in Canada, a complete series of the Palaeozoic rocks, from about the base of the Lower Silurian to the base of the Carboniferous. The dividing line between these rocks and the Laurentian series has been ascertained to be very nearly as follows. Commencing at the most eastern extremity of the Province, where the line between Labrador and Canada strikes the Gulf of St. Lawrence, and proceeding westerly, the coast consists of Laurentian rocks as far as Cape Tourment, near Quebec. The Mingan Islands and the Island of Anticosti are Silurian; the northern outcrop of this latter formation, therefore, probably lies in the bed of the St. Lawrence, not far from the north shore. From Cape Tourment westerly there is a narrow strip of the Silurian along the north side of the river, becoming gradually wider, until at Montreal it has a breadth of thirty miles. The line then approaches the Ottawa gradually; and at length, at the Chats Rapids, thirty miles above the city of Ottawa, it turns towards the south, crossing the river, and thence proceeding with a meandering course to the St. Lawrence, which it strikes in the neighborhood of Brockville. The whole of the Province south and east of the line thus laid down is Palaeozoic. Above Brockville the Laurentian rocks follow the north shore of the St. Lawrence until within a short distance below Kingston, where we again encounter the outcrop of the Lower Silurian. From this point the line between the Palaeozoic and Laurentian rocks runs westerly to the southeast corner of the Georgian Bay, north of Toronto, passing through the rear of the settled portions of the country lying on the north shore of Lake Ontario. The whole of Upper Canada south and west of this line, and also all except the most easterly islands of the Georgian Bay, are Palaeozoic. Upper Silurian rocks have also been found at the head of Lake Temiscamingue and at Lake St. John, on the Saguenay. Those of the former lake are, in the opinion of Sir W. E. Logan, a portion of the great northern basin which lies in the region of Hudson's Bay.

The Palaeozoic rocks of Western Canada have never been much disturbed, and are usually found lying nearly horizontally. They consist of the same subdivisions as those of the neighboring State of New York; namely, the Potsdam sandstone, Calciferous sandrock, Chazy, Birdseye, Black River and Trenton limestone, Utica slate, Hudson River group, Medina sandstone, Clinton and Niagara group, Onondaga salt group, Corniferous limestone, Hamilton group, and Chemung and Portage group.

In the country lying between the St. Lawrence and Ottawa the Palaeozoic rocks consist of the Potsdam sandstone, Calciferous sandrock, Chazy, Birdseye, Black River and Trenton limestones, Utica slate, and Hudson River group.

In Eastern Canada all the above deposits occur, and also some Devonian rocks and a portion of the lower part of the Carboniferous system, which are not found in Upper Canada. In general, the country south of the St. Lawrence and east of the meridian of Montreal, is in a very disturbed condition, and many of the rocks have been so much altered as to resemble somewhat the metamorphic rocks of the Laurentian system.

4. *The Glacial Drift.*—This deposit consists of various beds of clay, sand, and gravel, intermixed with boulders and remains of sea-shells, and of fishes now living in the Atlantic. It is spread out over the whole

* Compiled from the Reports of Sir W. E. Logan, Director of the Geological Survey of Canada.

surface of the Province, and is generally from ten to one hundred feet in thickness. In a few localities it has been ascertained to have a depth of two or three hundred feet. It is of the same age as the Glacial drift of the neighboring United States.

These are all the geological formations yet ascertained to exist in the Province of Canada. In this work it would be out of place to enter more diffusely upon the subject; and the reader is therefore referred to the various reports of the Geological Survey, where very full descriptions of the portions that have been examined will be found.

CATALOGUE OF THE ECONOMIC MINERALS OF CANADA.

METALS AND THEIR ORES.

- Magnetic Iron Ore.*—Marmora, four localities; Madoc, four localities; South Sherbrooke, Bedford; Hull, three localities; Portage du Fort.
- Specular Iron Ore.*—Wallace Mine (Lake Huron), MacNab, St. Armand; Sutton, three localities; Brome, three localities; Bolton.
- Limonite (Bog Ore).*—Middleton, Charlotteville, Walsingham, Gwillimbury West, Fitzroy, Eardley, March, Hull, Templeton, Vaudreuil, St. Maurice, Champlain, Batiscan, Ste. Anne, Portneuf, Nicolet, Stanbridge, Simpson, Ireland, Lauzon, St. Vallier.
- Titaniferous Iron.*—St. Urbain (Baie St. Paul), Vaudreuil (Beauce).
- Sulphuret of Zinc (Blende).*—Prince's Mine and Maimanse (Lake Superior).
- Sulphuret of Lead (Galena).*—Fitzroy, Lansdowne, Ramsay, Bedford, Bastard, La Petite Nation, Anse des Sauvages, and Anse du Petite Gaspé, Maimanse.
- Copper.*—St. Ignace, and Michipicoten Islands (Lake Superior), St. Henri, *native copper*. Prince's Mine (Lake Superior), *sulphuret of copper*. Mica Bay and Maimanse (Lake Superior), *sulphuret, variegated copper, and copper pyrites*. Bruce's Mine (Lake Huron), Root River, Echo Lake and Wallace Mine (Lake Huron), *copper pyrites*. Inverness and Leeds, *variegated copper*. Upton, *argentiferous copper pyrites*. Ascot, *copper pyrites containing gold and silver*.
- Nickel.*—Michipicoten (Lake Superior), *arsenial nickel, with a hydrated silicate of nickel*. Wallace Mine (Lake Huron), *sulpharseniuret of nickel*. Daillebout, Berthier, *nickeliferous pyrites*. Ham and Bolton, in small quantities, associated with chromic iron. The nickel in most of these different localities is accompanied with a little cobalt.
- Silver.*—St. Ignace, and Michipicoten Islands (Lake Superior), *native silver with native copper*. Prince's Mine (Lake Superior), *native silver with sulphuret of silver*.
- Gold.*—Seigniory of Vaudreuil (Beauce), on the Rivers Guillaume, Lessard, Bras, Touffe des Pins, and Du Lac, Seigniory of Aubert de Lisle, Rivers Famine and Du Loup, Aubert-Gallion, Poser's Stream, and the River Metgermet. All of these localities in the County of Beauce afford native gold in the alluvial sands. This auriferous region has an area of 10,000 square miles, and the precious metal has been found at Melbourne, Dudswell, Sherbrooke, and many other localities in the valleys of the St. Francis and the Chaudière. Native gold is also found in small quantities in Leeds in a vein with specular iron, and at Vaudreuil (Beauce) with blende and pyrites. These sulphurets are both auriferous, and the copper pyrites of Ascot also contain a small proportion of gold. The native silver of Prince's mine likewise contains traces of gold.

NON-METALLIC MINERALS.

- Uranium.*—The yellow oxyd of uranium is found in small quantities with the magnetic iron of Madoc.
- Chromium.*—Bolton and Ham are localities of large beds of chromic iron.
- Cobalt.*—At Prince's mine, Lake Superior, as *arseniate of cobalt*, and associated with nickel in the localities mentioned above.
- Manganese.*—Bolton, Stanstead, Tring, Aubert-Gallion, Ste. Marie, Beauce, Ste. Anne, *earthy peroxyd*.
- Iron Pyrites.*—Clarendon, Terrebonne, Lanoraie, Garthsbys.
- Graphite.*—Grenville, Fitzroy.
- Dolomite.*—Lake Mazinaw, North Sherbrooke, Drummond, St. Armand, Dunham, Sutton, Brome, Ely, Durham, Melbourne, Kingsey, Shipton, Chester, Halifax, Inverness, Leeds, St. Giles, Ste. Marie, St. Joseph.
- Carbonate of Magnesia.*—Sutton, Bolton.
- Sulphate of Boryta.*—Bathurst, MacNab, Lansdowne, and many localities on Lake Superior.
- Iron Ochres.*—St. Nicholas, Ste. Anne de Montmorency, Champlain, Waltham, Mansfield, Durham.
- Steatite.*—Sutton, Bolton, Melbourne, Ireland, Potton, Vaudreuil (Beauce), Broughton, Elzevir. The steatite of the last four localities is employed as a refractory stone, and that of Stanstead and of Leeds is ground and employed as a paint.
- Lithographic Stone.*—Marmora, Rama, Lake Couchiching.
- Agates.*—Isle St. Ignace, Michipicoten and Thunder Bay (Lake Superior), Gaspé.
- Jasper.*—Ascot, Rivière Ouelle, Gaspé.
- Labrador Felspar.*—Mille Isles, Drummond, and many other localities.
- Aventurine.*—Burgess.
- Hyacinthe.*—Grenville.
- Corundum.*—Burgess.
- Amethyst.*—Spar Island, and many other localities on Lake Superior.
- Jet.*—Montreal.

Quartzose Sandstone, for the Manufacture of Glass.—Cayuga, Dunn, Vaudreuil, Isle Perrot, Beauharnois, and many localities on the north shore of Lake Huron.—The sandstone of St. Maurice is employed as a fire-stone for iron furnaces.

Retinite and Basalt, for the Fabrication of Black Glass.—Many localities on Lake Huron and Superior.

Gypsum.—Dumfries, Brantford, Oneida, Seneca, Cayuga, &c. : the localities are very numerous.

Shell Marl.—Calumet, Clarendon, North Gwillimsbury, Bromley, MacNab, Nepean, Gloucester, Argenteuil, Hawkesbury, Vaudreuil, St. Benoit, Ste. Thérèse, St. Armand, Stanstead, St. Hyacinthe, Montréal, New Carlisle (Gaspé).

Phosphate of Lime.—Burgess, Hull, Calumet, Ottawa.

Millstones.—Several kinds of stone, more or less adapted to the purpose, are employed in Canada for the fabrication of millstones. The best is a corneous diorite which accompanies the serpentine of the Eastern Townships, and has been wrought at Bolton.

A siliceous conglomerate which serves to make millstones is found at Vaudreuil, at the Cascades, Ham, and Port Daniel. We may mention also for this purpose the granites of Stanstead, Barnston, Barford, Hereford, Ditton, Marston, Strafford, Weedon, and Vaudreuil (Beauce). The granite millstones of Vaudreuil are much esteemed. The pseudo-granites and diorites of the mountains of Ste. Thérèse, Rouville, Rougemont, Shefford, Yamaska, and Brome, are also sometimes employed to make millstones.

Grindstones.—A sandstone known as the gray-band, and found at the base of the Upper Silurian of Western Canada in many localities, is employed for the fabrication of grindstones. The Potsdam sandstone and a sandstone from Gaspé Basin are also employed for the same purpose.

Whelstones.—Madoc, Marmora, Lake Mazinaw, Fitzroy, Potton, Stanstead, Hatley, Bolton, Shipton, Marston.

Tripoli.—Laval, Lanoraie.

BUILDING MATERIALS.

Granites.—Large masses of a very beautiful intrusive granite are found in many of the townships of the East. Among other localities we may cite Stanstead, Barnston, Hereford, Marston, Megantic mountains, Weedon, Winslow, Stafford, and Lambton. The diorites of the mountains of Ste. Thérèse, Rouville, Rougemont, Yamaska, Shefford, and Brome, furnish also good building stones.

Sandstone.—A beautiful variety of yellowish-white sandstone occurs at Niagara, Queenstown, Barton, Hamilton, Flamboro' West, Nelson, Nassagaweya, Esquesing, Nottawasaga, and Cayuga. Other localities are Rigaud, Vaudreuil, Isle Perrot, St. Eustache, Terrebonne, Beauharnois, St. Maurice, Lac des Allumettes, and Fitzroy.

Calcareous Sandstone.—Brockville, Ottawa, and a great many places on the Ottawa river, St. Nicolas (Lauzon), Cap Rouge, Malbaie.

Limestones.—Malden, Manitoulin and St. Joseph Islands, Cape Hurd, Cabot's Head, Sydenham, Euphrasia, Nottawasaga, Mono, Esquesing, Nelson, Ancaster, Thorold, Marchedash Bay, Orillia, Rama, Mara, Marmora, Madoc, Belleville, Kingston, Macnab, Ottawa, Plantagenet, Hawkesbury, Cornwall, Isle Bizard, Isle de Beauharnois, Caughnawaga, Montreal, Isle Jésus, Terrebonne, Philipsburg, St. Dominique, Grondines, Deschambault, Beauport, Baie St. Paul, Malbaie, Upton, Acton, Wickham, Magoon's Point, Stanstead, Hatley, Dudswell, Temiscouata, Gaspé, Port Daniel, Richmond, Anticosti.

Hydraulic Limestones.—Point Douglas (Lake Huron), Paris, Cayuga, Thorold, Kingston, Loughboro', Hull, Quebec.

Roofing Slates.—Kingsey, Halifax, Lambton, Melbourne, Westbury, Rivière du Loup.

Flagging Stones.—Toronto, Etobicoke, River Credit, York, Temiscaming, Bagot, Horton, Clarendon, Sutton, Potton, Stanstead, Inverness, Port Daniel.

Clays.—Clays suitable for the fabrication of red bricks, tiles, and coarse pottery, are everywhere found through the valleys of the St. Lawrence, Richelieu, and Ottawa. Clays for the manufacture of white bricks are met with at London, Toronto, Cobourg, and Peterborough.

Moulding Sand.—Augusta near Prescott, Montreal, Acadie, Stanstead.

Fullers' Earth.—Nassagaweya.

Marbles.—*White*.—Lake Mazinaw, and Philipsburg.

Black.—Cornwall, Philipsburg.

Red.—St. Lin.

Brown.—Pakenham.

Yellow and Black.—Several varieties at Dudswell.

Grey and Variegated.—MacNab, Philipsburg, St. Dominique, Montreal.

Green.—Serpentines affording several beautiful varieties of marble occur at Grenville, and along a range of 150 miles in the Eastern Townships. Among other localities we may mention Stokely, Brompton, Oxford, and Vaudreuil (Beauce).

COMBUSTIBLES, &c.

Peat.—Humberstone, Wainfleet, Westmeath, Beckwith, Goulbourn, Gloucester, Cumberland, Clarence, Plantagenet, Alfred, Caledonia, L'Original, Osnabruck, Finch, Winchester, Roxburg, Longueuil, St. Hyacinthe, Monnoir, the Seigniorie of Rivière du Loup, Rivière Ouelle, Macnider.

Petroleum.—Mosa and many localities on the Thames, River St. Jean and Ruisseau-Argenté (Gaspé).

Asphaltum.—Enniskillen.