GEOLOGICAL AND NATURAL HISTORY SURVEY OF CANADA
ALFRED R. C. SELWYN, LL.D., F.R.S., F.G.S., DIRECTOR.

OBSERVATIONS

ON THE

GEOLOGY, ZOOLOGY AND BOTANY

OF

HUDSON'S STRAIT AND BAY,

MADE IN 1885.

BY

ROBERT BELL, B.A.Sc., M.D., LL.D., F.R.S.C.

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OTTAWA, April, 1886.

To ALFRED R. C. SELWYN, ESQ., LL.D., F.R.S., F.G.S.,

Director of the Geological and Natural History Survey of Canada.

SIR,—I beg to submit, herewith, my report as Geologist and Naturalist on the Second Expedition to Hudson Strait and Bay, sent out by the Government of Canada on board the steamship "Alert" in 1885.

I have the honour to be,

Sir,

Your obedient servant,

ROBERT BELL.

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My preliminary report, of December, 1885, gave a general account of the field-work of the year, and a narrative of the Second Hudson's Bay Expedition by the steamship "Alert," as far as the geological and biological work are concerned. I purpose, therefore, in the following pages, to confine my remarks to a fuller description of the results in these departments. These were, unfortunately, very limited, owing to the fact that most of our time was spent either at sea or in the ice, or in relieving the stations, which I had already visited on the "Neptune" expedition of the previous year, and had done as much geological work as possible in their neighborhoods. A month in the middle of summer, was also consumed in our voyage from the Straits to St. John's, Newfoundland, and back again, after the "Alert" had there undergone some necessary repairs.

Botanical collections.

Botanical specimens were again collected at all places visited. Collections of plants had also been made by some of the observers at the stations before the arrival of the "Alert." Although the number of speciments obtained is quite large, yet only five species can be added to the list of 1884. In the appendix to the present report will be found a catalogue, by Prof. Macoun, of the plants collected while we were in Newfoundland. I am indebted to Major H. H. Lyman, of Montreal, for having prepared the accompanying list of the Lepidoptera, and some other insects collected last year by myself and Messrs. H. M. Burwell and Arthur Laperrière. The Coleoptera

Entomological collections.

have been kindly examined by Mr. W. H. Harrington. A number of specimens of birds, mammals and fishes were collected during the voyage, or obtained from some of the observers, especially Mr. Laperrière, who was in charge of the station at Cape Digges. I am indebted to Dr. Mathews, of York Factory, for additional specimens of birds, and to Mr. J. R. Spencer, of Churchill, for specimens of Back's grayling, and other fishes. After the zoological specimens shall have been critically examined, complete lists of them, along with those obtained around Hudson's Bay in previous years, will be published. I have much pleasure in acknowledging the kindness of the Right Revd. Charles Guay, of Cross Point, P.Q., in procuring canoes and endeavouring to hire Indians for the expedition. Mr. James MacNaughton, M.A., acted as my assistant during the season.

Birds, mammals and fishes.

It was considered desirable that the Report of the "Alert" Expedition, to be published by the Department of Marine, should contain an account of the geology of Hudson's Bay and the surrounding country; and accordingly, with the approval of the director, a report on this subject has been furnished. It embraces not only the general results of the geological observations of the "Neptune" and "Alert" expeditions of 1884 and '85, but also of the previous expeditions around Hudson's Bay, made principally on the east side, in 1875 and '77, and on the west side in 1878, '79 and '80, and in the interior in 1870 and '71. A chapter on the Economic Minerals of the Hudson's Bay Territories generally, is also included in the above Report.

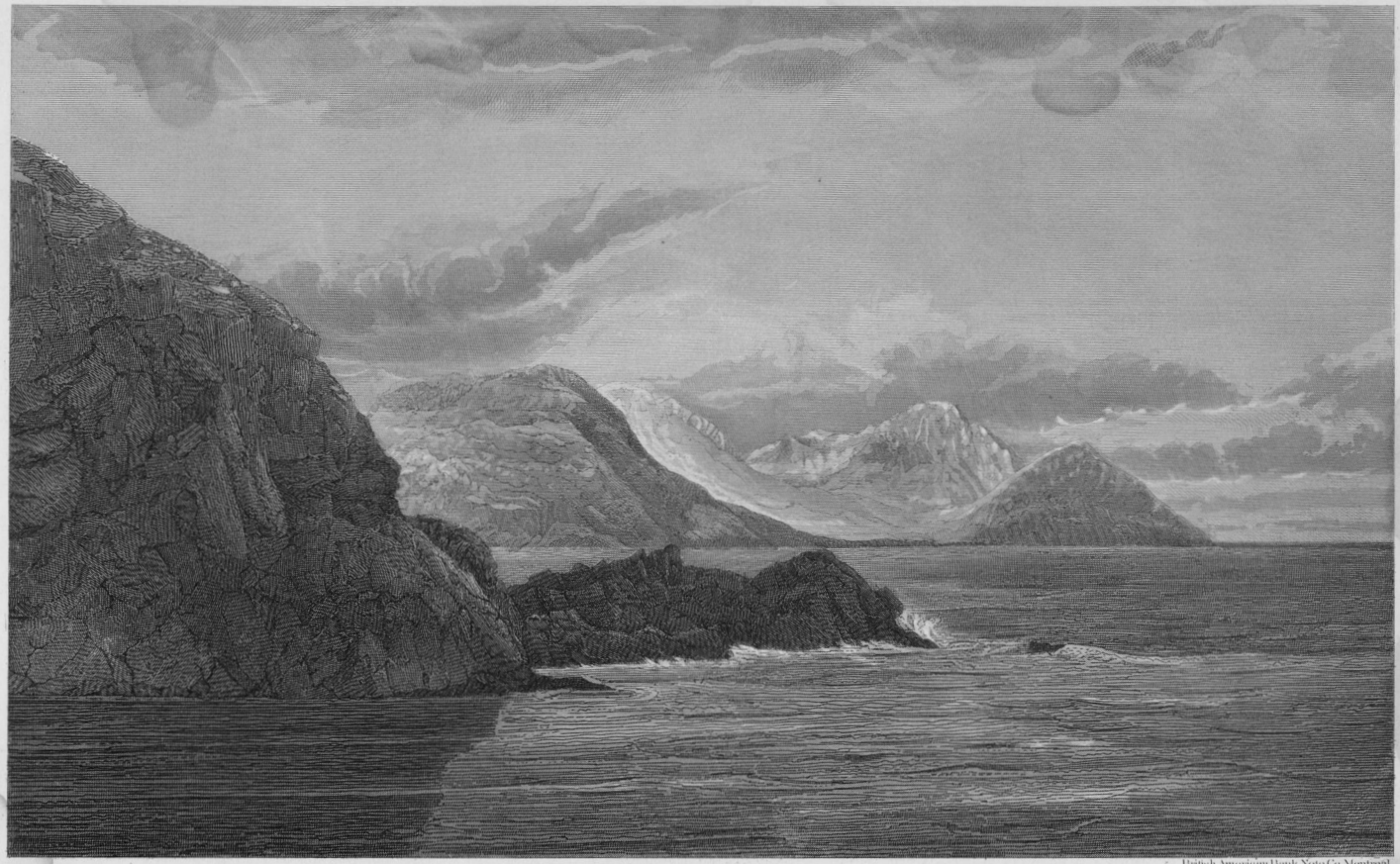
Report furnished the Department of Marine.

As all matters concerning ice, ocean currents, soundings, tides, meteorological phenomena, etc., belong to Lieut. Gordon's province, and will be fully reported on by him, I shall not allude to them except in their relation to geological questions.

As stated in my preliminary report, we left Halifax on the 27th of May, and after passing through the Gulf of St. Lawrence and the Straits of Belle Isle, steamed northward, near the edge of the ice-pack off the Labrador coast, to the entrance of Hudson's Strait, which we entered on tke 16th June. Beyond the Straits of Belle Isle numerous ice-bergs were passed every day, both in the open water, and among the field ice. When in the latter position they were observed to be almost always more or less completely surrounded by a space of open water. On the voyage back from Newfoundland to the straits, between the 27th of July and the 3rd of August, icebergs were again equally numerous, especially as we approached the Labrador coast, but on neither occasion did we meet with any of remarkable size or height, the great majority of them being comparatively small. Towards the entrance of Hudson's Strait it was noticed that the bergs furthest out to sea or to the eastward, carried stones, mud, or discolorations more fre-

Voyage from Halifax to Hudson's Strait

Ice-bergs.



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NORTH SIDE OF ENTRANCE TO NACHVAK INLET. LABRADOR.

SHOWING THE STEEP AND UNGLACIATED CHARACTER OF THE MOUNTAINS.

quently than those near the Labrador Coast. We entered Nachvak Inlet on the 1st of August, and were informed by Mr. Skynner, who had been in charge of the observatory station there since the previous year, that the fixed ice of the inlet had only disappeared on the 12th of July. Local ice. We afterwards learned that it had also cleared from Ashe's Inlet, (near North Bluff) in Hudson's Strait on the same day. Mr. Skynner informed us that the fixed ice extended only as far out as "The Breaker," a rock at the entrance of the inlet. Outside of this the ice was moving with the winds and currents all winter. In the months of June and July, wide lanes of open water were formed between the field-ice and the land. As far as could be observed, this ice was clear or free Foreign matter on field-ice. from dust and rock-debris, as if it had been formed away from the land. The clear ice continued till the end of June, when foreign matter began to appear upon the slowly moving floes. This, Mr. Skynner thought, was due to the fact that about that time the ice began to leave the adjoining shores, after having received upon its surface more or less rocky debris from the crumbling cliffs and slopes, or from having had earthy matter incorporated in it by freezing and by the action of high tides, such as those of Ungava Bay. During the winter, he found that the strong winds carried considerable quantities of dust and angular fragments of rock from the high cliffs and steep and loose taluses on either side of Nachvak Inlet, out upon the fixed ice, and when it broke up in July, this material was borne off to sea. Towards the end of July, all the field ice of the northern parts of the Labrador coast was discolored or "foxy," and had a decayed appearance. The dust or mud, Decaying ice. with which it was covered, was mostly yellowish and greyish in color. Gravel, angular stones, patches of stoney mud, and an angular boulder were occasionally observed.

Reference was made in my report of last year (p. 14 and 37 DD) Non-glaciated mountains of Labrador. to the steep, serrated and non-glaciated appearance of the mountains, along the northern part of the Labrador coast. Opportunities were afforded me in 1884, while passing up and down the coast in the "Neptune," and when ashore at a few points, of studying, sketching and photographing these mountains; and again, last year, their features were well brought out under the varying quantities of snow upon them in the months of June, July, August and October. The accompanying view, from a photograph, looking northward, across the entrance of Nachvak Inlet, is characteristic of the scenery on this part of the coast. As stated in last year's report, glacial grooves are to be seen in this inlet near the sea-level and parallel to the general course of the shores, but no trace of them could be observed on any of the higher levels which were examined. Terraces or banks of gravel and ancient shingle Elevated terraces and beaches. beaches were observed on either side of the inlet at various heights up

to an estimated elevation of 2000 feet. The mountains everywhere in this vicinity give evidence of long-continued atmospheric decay. The annual precipitation at the present time is not great, otherwise small glaciers would probably form among these mountains, which lie between latitudes 58° and 60°, and which overlook a sea, bearing field ice for half the year, and from which bergs are never absent. Patches of snow, however, remain throughout the summer in shaded parts of the slopes and on the highest summits, which range from 4,000 to 6,000 feet above the ocean.

Cape Chudleigh

Our stay at Port Burwell, Cape Chudleigh, on the inward voyage, was for only one night, and while we were in this port, on our return, the weather was so boisterous as to prevent me from going to any considerable distance from the ship. Some additional facts of interest were, however, noted in regard to the glacial phenomena of the neighborhood.

Mica and graphite.

It was stated in my report of last year that when we were at Ashe's Inlet, near North Bluff, the Eskimo gave us specimens of mica and graphite from the north shore of the Strait. During the winter and spring they brought to Mr. Ashe, the gentleman in charge of the observatory station at this place, numerous pieces of these minerals. From what they told Mr. Ashe, he concluded that both kinds were found at different localities all the way from Kimnirook, (see Report for 1884), westward to the place which the natives call Akuliak, at or near which Captain Spicer's trading station is situated. The mica appeared to be quite common. The specimens carried to Mr. Ashe, had apparently all been gathered on the surface; and, as the natives stated that it had been taken away in commercial quantities by the vessels visiting Capt. Spicer's station, the inference is that it must be abundant somewhere not far off. The largest specimens which I saw were about a foot in diameter. All were of a light-brown colour, and transparent when in moderately thin plates. Some pieces which I tested stood the fire well. From the accounts of the Eskimo last year, we inferred that they had found red hematite, inland from Kimnirook, but Mr. Ashe did not receive any specimens of it. In addition to pieces of quartz and iron pyrites they brought him a crystal of black sphene, an inch in diameter, from the north side of the straits opposite the station. The finding of a loose piece of crystalline limestone, like a common variety in the Laurentian rocks further south, was mentioned last year. The occurrence of sphene and graphite constitute, perhaps, additional evidence of the existence of such limestone *in situ* on the north side of Hudson's Strait. While exploring Big (or Turenne) Island, Mr. Ashe had found in its southwestern part a great mass, *in situ*, of a very coarse, greenish-grey hornblende rock, composed of large, radiating crystals,

Quality of mica.

Coarse hornblende rock.

similar to a loose mass which I had noted the previous year not far from the station. This is an additional fact indicating an eastward movement of the ancient glaciers.

Stratification of gneiss.

On the main north shore of the straits, just west of the channel between it and Big Island, the stratification of the gneiss is very conspicuous. The strike is parallel to the above, and the dip is northward for a considerable distance. While drifting up and down with the ice near to the coast in these parts, the peculiarities of the gneiss, and of veins cutting it, could be observed, but there is no chart of the shore or other means of identifying the localities.

Limestone fragments on ice-pans.

Many of the pans of field-ice off Big Island had gravel strewn upon them. This was found to consist of gneiss with a certain proportion of darkly-colored schists. But on ice-pans further up the coast, or to the north-westward, I found fragments of shaly marl and of grey limestone with fossils, among which *Receptaculites Oweni* was easily distinguished. Shells and bryozons, belonging to moderately deep-water species, were found on the same pans. The limestone fragments, just mentioned, would point to the occurrence of Silurian rocks on or near the great bays in the western part of the north-shore of the Straits, where the land is said to be low. Dr. Franz Boas of Berlin has recorded the existence of these rocks in the interior of Baffin Land, only about two degrees of latitude north of this region. He says:* "Through the occurrence of the Silurian rocks on the Nettilling (Lake) the discovery of the same formation at the upper end of Frobisher Bay increases in value. We must now suppose that the Silurian limestones, which appear at Prince Rupert's Inlet, extend from there to Frobisher Bay, and overlie the granites and gneisses of Baffin's Bay and Davis' Strait. We will not be far astray if we connect this extensive Silurian district with the limestones which occur to the south of Igluling, and which form the flat eastern half of Melville Peninsula. Southward from Nettilling, these rocks rise into low hill-ranges, which are indicated on the sketch by Padloaping."

Limestone north of Hudson's Strait.

Limestone of Melville Peninsula.

In a letter to me, referring to the geology of Baffin Land, Dr. Boas says: "The most interesting geological problem of the country is a study of the line of division between the Silurian plains and the eastern highlands. I suppose that Silurian rocks will be found, either in the remotest corner of White Bear Sound, or close to it. Probably the strata will be found lying horizontally, and then soundings in the Lakes Amakdjuak and Nettilling, will be of great importance. It must be important for the problems of glaciation to survey the *inner* rim of the

White Bear Sound.

* Page 50 of Dr. A. Petermann's Mitteilungen aus Justus Perthes Geographischer Anstalt, Nr. 80. Gotha, November, 1885.

enormous basin formed by the chain of mountains of Davis' Strait, the plateau of Nugumit, Kinguait, Sikosuilat, Southampton Islands and Melville Peninsula,"

In my report of last year, it was stated that fragments of grey, drab and yellowish-fossiliferous limestone, apparently Silurian, were common near Cape Chudleigh. If the supposition be correct that the glaciation of Ungava Bay was from the southward out into Hudson's Strait, and thence round Cape Chudleigh into the bed of the ocean, these fragments would indicate that the limestones from which they are derived exist somewhere in the bay, either under the water or on Akpatok Island, which is described as low and level.

Ungava Bay.

Having failed to enter Ashe's Inlet on the inward voyage, we crossed the straits to Stupart's Bay, in Prince of Wales' Sound. Our visit to this station was too brief to allow me to make any fresh geological explorations in the neighborhood. The geology and scenery of this locality are described in my report of last year. The accompanying engraving, from a photograph, represents a view of the country from Eskimo Inlet, about two miles south of Stuparts' Bay, looking westward, and it may be taken as a characteristic specimen of the scenery on the south side of Hudson's Straits. I found that Mr. Stupart and his associates had collected numerous geological specimens for me. They consisted of gneiss, soapstone, quartz, felspar, hornblende, mica-rock, epidote and iron pyrites, all apparently derived from ordinary Laurentian rocks, which prevail everywhere in this region.

Stupart's Bay.

While at Port de Boucherville, on the south end of Nottingham Island, some further exploration was made in the vicinity, but nothing worthy of remark, was observed.

Last year Mansfield Island was found to consist of flat-lying, grey limestones. The fossils then collected, on its eastern side, although badly preserved and not numerous, indicate the age of our Niagara formation.

Niagara formation.

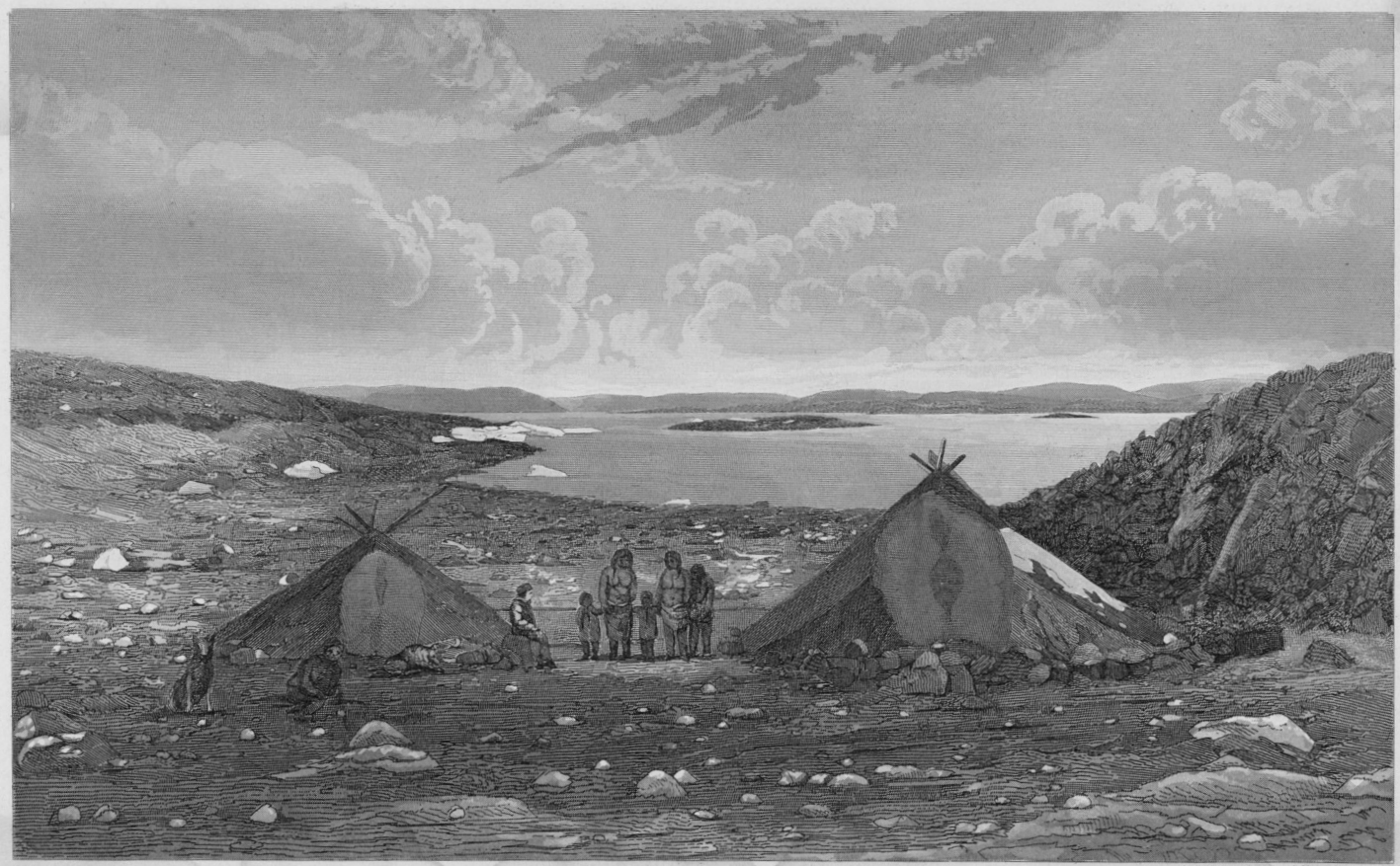
Similar limestones prevail on Southampton Island (proper) from Cape Southampton to within twenty-five or thirty miles of Cape Pembroke at its north-eastern extremity, the latter interval being occupied, according to Captain William Hawes, of the Hudson's Bay Company, by rugged, dark-looking rocks, like those of Hudson's Strait, which are Laurentian gneiss. The large island north of Southampton Island, of which Seahorse Point forms the eastern extremity, and which Lieutenant Gordon has called Bell's Island, in the absence of any other name, is mountainous and appears to consist of gneiss.

Southampton Island.

Gneiss.

In the end of August, while the "Alert" was lying in Port Lapierrière, at Lieut. Gordon's request, and with the assistance of Mr. James Tyrell, P.L.S., I made a track-survey of the Outer Digges Island. It

Track-survey of Outer Digges.



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VIEW WESTWARD IN PRINCE OF WALES SOUND, HUDSON'S STRAIT.

SHOWING OUTLINE OF MOUNTAINS IN THIS REGION. ESKIMO TENTS IN FOREGROUND.

was found to be about eight miles long and three miles wide, and to be separated from the Inner Digges by a straight channel, about one mile wide. It is formed entirely of Laurentian gneiss, which strikes with the longer axis of the island. This island has been thoroughly glaciated. Around its western end the groovings run north-eastward (true), but along the north side they set more nearly east, showing that the stream of ice was flowing out of the bed of Hudson's Bay and eastward in the Strait. The outer points of this shore are all rounded and bald, with the glacial grooving and fluting strongly marked, as may be seen in the accompanying sketch of one of these small capes. Glaciation.

CAPE ON NORTH SIDE OF OUTER DIGGES ISLAND.

The south-eastern part of Inner Digges Island presents a high and nearly vertical cliff, facing the still higher bluffs of Cape Wolstenholme, of which an outline-sketch was given in my report for 1880. From the cape these bluffs continue southward for some miles, diminishing in height and merging into the rounded hills of the coast further down. At about thirty miles south of the cape the country, forming the immediate coast, has become comparatively low, but ranges of partially-rounded hills rise higher and higher towards the interior. On our return from the west side of Hudson's Bay in the month of September, I explored this part of the coast in a small boat, and found the rocks to consist of common forms of gneiss, with veins and patches of fine-grained red granite in some places. On the mainland, about twenty miles south of Port Lapierrière is a very ancient Eskimo camping ground, which is still inhabited. We could not ascertain from the natives what they called the place, and for the sake of convenience in having some name for it we called it Hyla. In this neighborhood the evidences of the rapid recession of the sea are visible on all sides, in the form of shoaling bays and lagoons, as well as in raised beaches and ridges of shingle. The latter sometimes form the isth- High bluffs of Cape Wolstenholme. Coast south of Cape Wolstenholme. Recession of the sea.

muses, separating bays or connecting islands with each other or with the main land. Ponds and small lakes, of a mile or two in length, are numerous between the ranges of hills, or small mountains in the rear. The clay and sand in the valleys between these ridges, up to an elevation of about 200 feet above the sea, are full of marine shells, of which the genera *Tellina, Saxicava, Cardium, Pecten, Mya, Mytilus* and *Astarte* are the most common. Viewed from a distance, these hills and mountains have a naked appearance, but in walking over the country itself, the grasses and sedges, and a variety of Arctic plants which grow around the ponds and lakes, and in sheltered places among the hills, give the landscape a pleasantly green appearance in many places. No shrubs are to be seen except the creeping willows, but the Eskimo make mats for the floors of their summer tents by fastening together, in regular order, twigs of dwarf birch, (*Betula glandulosa*, Michx,) about three feet long, which we understood they obtained in the interior. The natives on this part of the coast live by hunting the reindeer among the hills, and the white whale, polar bear, walrus and seals on the coat. At certain seasons they also procure a good supply of waterfowl and brook trout.

Appearance of the country.

Close to the shore, behind an island, and about a mile south of the old Eskimo camps, above referred to, a very conspicuous vein is exposed along the face of a bluff of gneiss. It is about thirty feet wide in one part, and consists of white quartz next the walls, with coarsely crystalline red felspar in the centre. A few plates of darkly-coloured, uneven mica were also observed.

Large quartz and felspar vein.

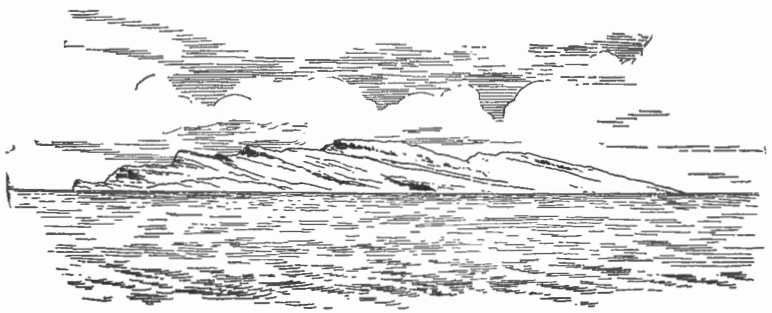
The general outline of the land on this part of the coast, as seen from a distance out at sea to the westward, slopes gradually up to the westward, until the brink of the great precipices of Cape Wolstenholme are reached. The elevated plateau above the precipices has a tolerably even appearance, as if it had been smoothly and uniformy glaciated. The high and almost perpendicular precipices of Cape Wolstenholme and the east end of the Inner Digges Island, which faces each other, present a singular contrast to the planed surface of the Outer Digges, and the apparently glaciated plateau of the mainland above the cape. It is possible that part of the ancient glacier, in passing out of the bed of Hudson's Bay, became jammed against the inside of the high angular barrier formed by the Digges Islands, on the one hand and the mainland on the other. The narrow channel which separates the Inner Digges from Cape Wolstenholme must be very deep, if we may judge from the quantity of water which flows through it with every tide, producing a strong current in the sea to the south of the Digges Islands.

Elevated plateau.

During our short visit to the harbour of Churchill a strong gale of wind with rain prevailed, so that no fresh geological work could be attempted beyond the limits which had been explored in this vicinity

in 1879. On the return voyage from Churchill, we visited a large chain of islands in the north-eastern part of Hudson's Bay, which run north-eastward between latitudes 59° and 60°, terminating in that direction east of latitude 80°. On some sketch-charts, a group of islands in this part of the bay had been marked "Sleepers," but as there are also two other groups called North Sleepers and South Sleepers, not far off, Lieutenant Gordon and I named these the Ottawa Islands, in order to distinguish them clearly and to prevent confusion. Lieutenant Gordon made a running survey of the northern part of the chain, and we named the individual islands in honor of the citizens of Ottawa who had generously aided in missionary enterprise in Hudson's Bay. A copy of Lieutenant Gordon's chart of the Ottawa Islands accompanies this report. The outermost of these shown on the chart, and called J. Gordon Island, consisted of thick, stratified masses, presenting a variety of external appearances, and probably of volcanic origin, all dipping westward at a moderate angle, as represented in the accompanying outline of the island.

The Ottawa Islands.



J. GORDON ISLAND FROM THE NORTH.

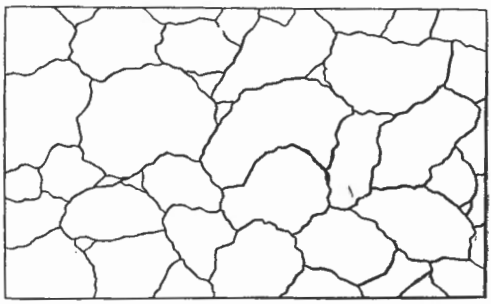
An opportunity was afforded me of landing upon a small island lying about two miles to the southwest of Gilmour Island (see chart) in latitude 59° 48′, longtitude 80° 6′. It was found to consist entirely of a greenish-grey diorite, which, on fresh fracture, is mottled with darker and lighter shades. In a vertical section, found on the east side of the island, the diorite presents the "bouldery" or concretionary appearance shown in the annexed sketch, the larger divisions having a diameter of about two feet. The rock is cut by small veins of quartz, running in a northwesterly course (true) in which specks of copper pyrites were detected. It also contains thin, short and irregular veins of asbestus and green epidote. Old weathered surfaces of the diorite are very rough, but nearly the whole island bears the marks of glaciation. On the southern and central parts of the island the principal striæ run N. 60° to 80° E., magnetically, or N. 20° to 40° E., astronomically, the

Greenish-grey diorite.

Copper pyrites and asbestus.

variation of the compass having been found to be about 40° W.

Glacial striæ. Another set of grooves, near the centre of the island, was found to run S. 65° E. mag., or about N. 75° E., true. On the east side of the island, the grooves run N. 35° E. mag. or N. 5° W., true.



The forms of the roches moutonné and other evidence afforded by the grooving and fluting of the rocks of this island themselves, go to show that the direction of the glaciating force was from the southward and south-westward and not from the contrary direction. Raised beaches are well marked up to the highest point of the island, about forty or fifty feet above the sea level. Much of the shingle of the island consists of dolomite of the Manitounuck group, and this fact is a further evidence that the drift in this region came from the south-

Northward course of drift. ward, since these rocks have, as yet, been found only on the islands and shore of the Eastmain coast between Cape Jones and Cape Dufferin. The islands further out to sea, opposite to this part of the coast are also believed to consist of rocks of the Manitounuck group. Specimens, said to have been broken from the fixed rocks of the Belchers, opposite

Belcher Islands Little Whale River, were obtained at my request, from the Eskimo and are found to consist of amygdaloid, white and grey dolomite, a soft grey schist and columnar calcspar, the last named apparently from a thin vein.

Appearance of the Ottawa Islands. All the larger islands of the Ottawa group are bare, rugged and mountainous. The rocks of Perley, Pattee, Gilmour, Booth and Bronson Islands appeared to be all the same as those of the small island which has been described. The surface of the hills, which on Gilmour Island rise to a height estimated to be about 1,800 feet, is everywhere extremely rough and pitted in appearance.

Walruses and white whales. We found the small island, on which we landed, inhabited by considerable numbers of walruses. Some white porpoises or small white whales (*Delphinopterus catodon*, Linn.) were also seen in the vicinity. The remains of a number of Eskimo camps and part of the skeleton of a large whale were observed on the island. A few pieces of driftwood had been cast upon it.

The Laurentian System Around Hudson's Bay.

The vast Laurentian area of the north-eastern part of North America forms a very considerable proportion of the whole continent and, geologically speaking, it may be regarded as its nucleus. Greenland, on the other side of Baffins' Bay and Davis' Straits, consists, as far as known, almost altogether of the same rocks. Hudson's Bay, which is nearly half as extensive as the Mediterranean Sea, lies in the middle of the continental portion of the great Laurentian area and the waters drain into it from all sides. The country slopes towards it from the Rocky Mountains, more than 1,300 miles to the westward, from the centre of Labrador, 500 miles to the eastward and from the immediate vicinity of Lake Superior in the south. Thus, the waters of this great interior sea occupy only the centre of what may be called the basin of Hudson's Bay. This wide depression has existed from early geological times, as is shown by the Manitounuck rocks of the eastern shore and islands and by the Silurian limestones of Mansfield and Southampton Islands and of the southwestern shores of Hudson's Bay and James' Bay, as well as the Devonian rocks of the latter. These flat-lying palæozoic strata probably also extend over much of the bed of the bay, judging by its shallowness and the uniform depth of its waters, and also from the composition of the materials of the drift which have been carried out of it during the glacial period. None of the unaltered rocks around the Bay have undergone any marked disturbance, so far as known. The observations of Dr. Franz Boas and others around Fox Channel would lead us to suppose that from a geological standpoint this body of water is a repitition of Hudson's Bay on a smaller scale (see above).

Nucleus of the continent.

Basin of Hudson's Bay.

Palæozoic strata.

Fox Channel.

The Manitounuck series is largely made up of rocks of volcanic origin and I have obtained specimens of diorites and porphyry from the north-western part of the bay. The probable site of the original source from which these rocks have been derived has not yet been ascertained. A set of immense dykes of trap along the Mattagami River running northward towards James' Bay, was described in my report for 1875; and other dykes, having the same general course, were found along the east side of James' Bay in 1877. No irregularity has been found in the bottom of Hudson's Bay which might indicate a seat of volcanic disturbance in former times. The unexplored district behind Cape Henrietta Maria may yet throw some light on this subject. The volcanic rocks of the Manitounuck group of the Eastmain coast and the islands opposite to it may have been originally derived from the neighbourhood of Clear-water Lake to the eastward of Richmond Gulf. Between Lake Superior

Source of volcanic rocks.

Clearwater Lake.

and Hudson's Bay, I have observed that, other things being equal, the water of lakes where igneous rocks prevail, is much clearer than those surrounded by gneiss or schists. The Rev. Mr. Peck visited the lake referred to in 1884, and he informs me that it merits its name from the clearness of its waters.

Schistose bands

Schistose bands and areas which have been classified as Huronian are largely developed within the general limits of the Laurentian country to the south and west of James' Bay and apparently also on the northwest side of Hudson's Bay, but to the eastward few indications of these rocks have yet been discovered. The Labrador peninsula measures, as nearly as possible, 1,000 miles from the Straits of Belle Isle due west to the Eastmain coast of James' Bay, by 1,000 miles from Cape Wolstenholme, on Hudson's Straits, to Mingan on the Gulf of St. Lawrence. The interior of this vast region has not yet been explored geologically, except to a very limited extent, so that rocks of the class called Huronian may exist in great force in some parts of it A non-fossiliferous, but unaltered limestone, like those of the Manitounuck group is found around Lake Mistassini near the head of the Rupert River in the southern part of the above region.

Labrador Peninsula.

The gneissic rocks of the east coast of Hudson's Bay have been described in my reports for 1875 and 1877, and those of Hudson's Straits in the report for 1884. Dr. Frans Boas, in the course of his explorations has made some notes on the fundamental rocks of Baffin Land, which stretches from Hudson's Straits northward through twelve degrees of latitude, or to Lancaster Sound. At page 57 of his report (Dr. A. Petermann's Mitteilungen aus Justus Perthes Geographischer Anstalt, Nr. 80. Gotha. Nov. 1885), he says: "Let us, in conclusion, cast a glance on the geological structure of the last-mentioned territory (the northern part of Baffin Land). The nucleus of the mountain masses appears to be everywhere gneiss, which I found especially at Kinguait and Panguirtung. In closest combination with the gneiss, granite, also occurs, which, especially large-grained, appears in the coast ranges and islands.—Anarmtung and Nuvakdjuak in Cumberland Sound; Padloping, Kexertaxdjuin, Nudlung, Tupirbikdjawitjung and Siorartijung on Davis Strait."

Rocks of Baffin Land.

"In Cumberland Sound, as well as in the Naguimiut plateau, which latter is mostly composed of fine-grained granites, there are found at isolated places, diorites and trap-granulites which have broken through the granite. The occurrence of these to the south on Blunt peninsula, has been confirmed. In Cumberland Sound I found them at Panguirtung and in a well-marked dyke in Akuliaxling eastward from Kexerten. The same diorite appears also in the mountain Kaliugujang to the east of Kinguait."

Cumberland Sound.

"The Silurian limestones, overlying the old crystalline rocks, have been already mentioned. The same are found besides in Field Bay, and they compose nearly the whole northern coast of Baffin Land. Hall found sandstone at Lock's Land, which perhaps belongs to the Carboniferous formation. It is said to resemble that found by Parry at Antridge Bay (Fury and Hecla Strait). Here may also be mentioned the samples of sandstone found by Bessils at Point Garry. From accounts by Captain Walker of the ship "Erik," coal is found in loose boulders in a stream at Eclipse Sound and on Aggidjeu (Durban Island)." Rocks of other northern localities.

The gneissic rocks within the immense area which has been described, no doubt represent a great period of geological time, and comprise a vast thickness of strata, the amount of which it would be impossible to determiue with any degree of accuracy. Certain areas of a massive granitoid character, are regarded as "primitive" gneiss, and there is little doubt they are more ancient than those Laurentian rocks which are regularly and distinctly stratified, and consist of bands of different lithological characters, such as prevail in the Ottawa valley. As a general rule, in the great region around Hudson's Bay, the gneiss is of a very monotimous character, consisting of the commoner reddish and greyish varieties. It is mostly massive, highly crystalline and hard, except where it has been exposed for ages to atmospheric influences, as in the non-glaciated districts. The fresh rock will break almost as easily across the lines of stratification as parallel with them. The average direction of the lamination is sometimes pretty constant over a considerable extent of country, but it is as frequently, greatly contorted on the small scale, and so much disturbed on the large scale as to render it almost impossible to trace out and map its structure. The gneisses of this kind are not known to carry any useful minerals, except such as mica and felspar in coarse granite veins. On the other hand, in the more southern districts, where the gneisses are somewhat regular, and where their different divisions are capable of being mapped, we find phosphate of lime, graphite, limestone, barytes, serpentine, magnetite and hematite, pyrites, gelena, copper ores, &c. These rocks appear to be newer than the massive gneisses which prevail in the north. Characters of gneisses. Useful minerals.

The continuity and the geographical compactness of the great metamorphic or Laurentian area of the north-eastern part of the continent are themselves evidences of the close relationship in age of the rocks comprised within it, whereas there is more room for uncertainty on this point in reference to widely separated areas of metamorphic rocks more or less surrounded by newer formations. The various bands of rock which in Canada have been recognized under the name Huronian Evidences of relationship in age.

all lie within the general geographical limits of the Laurentian country, and are either stratigraphically incorporated amongst the members of the Laurentian series, or present no want of conformity to them. A variety of altered rocks, bearing a strong resemblance to those of some of the Huronian bands are found elsewhere, as in the Eastern Townships and New Brunswick, but their relations to the Laurentian system cannot be so easily determined.

Quartzites of Lake Huron.

The series of rocks on the north side of Lake Huron, to which the name Huronian was first applied, is made up largely of quartzites, but to the north and west of this region these form only a minor portion, or are altogether wanting in the bands called Huronian, and which are composed principally of the other rocks, associated with the Lake Huron quarzites. They consist of more or less massive diorites, argillaceous and dioritic slate-conglomerates, granitès and syenites, schistose and jaspery iron ores, limestones or dolomites, and imperfect gneisses, together with a great variety of schists, such as mica and hydro-mica, talcoid, chloritic, dioritic, argillaceous, silicious, epidotic, hornblendic, felsitic and dolomitic. Within the general limits of the Laureantian area, nearly all the metallic ores and other useful minerals, as yet known, have been found in these rocks, and, therefore, their discovery and correct delineation on the geological map are important. As far as our explorations have gone, rocks of these kinds, and which may for convenience be styled Huronian, are much more abundant in the region between the Great Lakes and Hudson's Bay than anywhere in the Labrador peninsula or north of Hudson's Strait. They have been found at three places on the east coast of James' and Hudson's Bay. (See Report of 1877.) Mr. John McLean mentions them south of Ungava Bay. Some of the rocks of Nachvak, on the Atlantic coast, may be classified with them; and they are believed to occur at Ramah and near the entrance of Hamilton Inlet, on the same coast.

Associated rocks.

Useful minerals in Huronian rocks

Geograpical distribution of Huronian rocks.

Geology of the West Coast of Hudson's Bay.

During the past season I have received from a friend a carefully labelled collection of rock-specimens from the north-west coast of Hudson's Bay, between Eskimo Point and Chesterfield Inlet; and in connection with these a few remarks may be made on the geology of this region. Other specimens from this part of the coast were obtained in 1884 and referred to in my report for that year (page 34 D D.) My own explorations on this coast, beyond Churchill, consist of a boat voyage to a point a short distance north of Button's Bay, in 1879, and

Eskimo Point to Chesterfield Inlet.

an examination of Marble Island in 1884. The general character of the land about Chesterfield Inlet could be plainly seen from the ship when we were in that vicinity in the latter year. I have, however, received from friends who have travelled in these parts many particulars in reference to this coast. Professor James Tennant, of London, has described some rock-specimens from the north-west side of Hudson's Bay, and also from Repulse Bay, further north. From these various sources of information some light is thrown on the geology of the coast. Marble Island. Prof. Tennant.

Between Seal River and Eskimo Point, a distance of about 140 statute miles, the shore-line appears to be uniform with a low country behind it, broken only by an occasional hummock, probably of drift. The shingle of the beach is said to consist largely of limestone, and it is not improbable that behind this section of the coast, there is a considerable area of the flat-lying limestones, similar to those along the lower parts of the Churchill and Nelson Rivers. If this part of the coast were occupied by crystalline rocks, we should probably have a hilly country with a broken coast-line, like that further north, whereas the low appearance of the land and the even trend of the shore are analagous to the conditions which prevail where the Silurian rocks are met with further south on the Bay. Coast from Seal River to Eskimo Point. Probable area of limestone.

From Eskimo Point to the entrance of Chesterfield Inlet, the distance is about 180 statute miles, in a straight line. The rock-specimens from this section embrace fine-grained hornblende-schists, greenstones, quartz and epidote rock, light grey, coarse-grained sandstone, altered to quartzite, and holding fragments of indurated red shale, compact banded white quartz-rock, with crystals of iron pyrites in some of the layers, quartzite like that of Marble Island, grey felsites, crystalline hornblende-rock, diorite consisting of compact white felspar with long crystals of dark hornblende, banded grey hornblende and quartz-rock, with some layers approaching chert, mica-schists of different kinds, mixed hornblende- and mica-schist, chocolate-colored porphyry with flesh-colored crystals of felspar and grains of clear quartz, granulite, red jasper with dull fracture, hard, brownish-red sandstone, grey felsitic quartzite with lenticular patches of dark mica-schist, chloritic schist, about fifty pounds of granular iron pyrites, several hundreds of cubes of iron pyrites, the largest measuring about one inch in diameter, taken from a dark, glossy schist, quartz veinstone with large scales of light-colored mica, with garnets, calcspar veinstone with embedded crystals of quartz and having grey steatitic rock adhering to it, also a veinstone of quartz, containing silky radiating aggregates of hornblende and a few specks of calcspar and iron pyrites; some soft greenish schist is attached to this specimen. There are eleven specimens of the granular iron pyrites, which Varieties of rocks. Veinstones. Iron pyrites.

were collected at different points in the above distance. Small pieces of soft dark-greenish schist adhere to some of them. Mr. Hoffmann has made an assay of one of the specimens of pyrites from a bay south of Cape Jones, which forms the southern horn of Rankin Inlet, and found it to contain no copper, but to show traces of gold and 0.175 of an ounce of silver to the ton of 2,000 pounds. A specimen of similar pyrites, obtained from a place on this coast which the Eskimo call Iñari, in 1879, had a small quantity of light bluish-grey magnesian limestone adhering to it. These specimens, which all resemble the pyrites from Tilt Cove in Newfoundland and Capelton in the Eastern Townships, except in the absence of copper, are evidently from good-sized veins. The mineral is in common use among the Eskimo for striking fire. The discovery of traces of gold and silver in the specimen last assayed by Mr. Hoffmann is interesting. Specks of gold are mentioned by Tennant in a specimen of quartz from Repulse Bay.

Gold and silver.

Pyrites from veins.

Gold in quartz.

The majority of the lithological specimens brought from the coast in the whole interval between Eskimo Point and Repulse Bay, correspond with the rocks of the Huronian series. Laurentian types are absent from the collections. So far as we know, therefore, the probabilities are that Huronian rocks prevail all along the north-west coast of Hudson's Bay, from Eskimo Point to Chesterfield Inlet, and again at Repulse Bay; possibly also, in the interval between the last mentioned localities.

Huronian series on the N. W. side of Hudson's Bay.

Marble Island, as far as examined, consists mainly of light-colored, fine grained quartzite, associated with glossy mica-schists. Among the specimens obtained from the mainland, is one of similar quartzite of a delicate pink or flesh-color, from a point on the south side of Nevil Bay. On Marble Island the average strike is southwestward or in this direction, so that the two localities may occupy the same geological horizon. White quartzite is reported as occurring further south-west in the interior, especially in the region to the north-east of Hatchet or Wollaston Lake, and in my report for 1882, page 28 C C, it was stated that boulders of this rock are abundant at the Long or Methy Portage, still further south-west.

Quartzite of Marble Island.

Quartzite on mainland.

Quartzite in the interior.

APPENDIX I.

LIST

BY PROFESSOR MACOUN

OF

PLANTS COLLECTED IN NEWFOUNDLAND IN 1885,

BY

DR. ROBERT BELL.

I, Brigus. II, Petty Harbour. III, St. John's. IV, Topsail.

No.		I.	II.	III.	IV.
	I. RANUNCULACEÆ.				
1	Thalictrum Cornuti, Linn				*
2	Ranunculus acris, Linn	*			
3	" repens, Linn	*			
	II. NYMPHÆACEÆ.				
4	Nymphæa odorata, Ait			*	
5	Nuphar advena, Ait		*		
	III. SARRACENIACEÆ.				
6	Sarracenia purpurea, Linn		*		
	IV. VIOLACEÆ.				
7	Viola blanda, Willd	*			
8	" cucullata, Ait				*
	V. CARYOPHYLLACEÆ.				
9	Stellaria media, Smith				*
10	" borealis, Bigel	*			
11	Cerastium viscosum, Linn	*			
12	Sagina procumbens, Linn		*		
	VI. SAPINDACEÆ.				
13	Acer spicatum, Lam				*

No.		I.	II.	III.	IV.
	VII. LEGUMINOSÆ.				
14	Vicia Cracca, Linn				*
	VIII. ROSACEÆ.				
15	Prunus, Pennsylvanica, Linn				*
16	" Virginiana, Linn				*
17	Spiræa salicifolia, Linn	*			*
18	Poterium Canadense, Gray				*
19	Agrimonia Eupatoria, Linn				
20	Potentilla fruticosa, Linn	*			
21	" tridentata, Ait	*			
22	Rubus strigosus, Michx	*	*		
23	" villosus, Ait		*		*
24	" triflorus, Richards				*
25	Rosa nitida, Willd				
26	Pirus arbutifolia, Linn		*		
27	Amelanchier Canadensis, T. & G., *var.* oligocarpa, Gray		*		
	IX. ONAGRACEÆ.				
28	Epilobium angustifolium, Linn				*
29	" coloratum, Muhl		*		
	X. DROSERACEÆ.				
30	Drosera rotundifolia, Linn	*	*		
	XI. CORNACEÆ.				
31	Cornus Canadensis, Linn				*
	XII. CAPRIFOLIACEÆ.				
32	Linnæa borealis, Gronov	*			*
33	Viburnum nudum, Linn		*		
34	" pauciflorum, Pylaie				*
35	Lonicera cærulea, Linn	*			
36	Diervilla trifida, Mœnch		*		
	XIII. COMPOSITÆ.				
37	Aster radula, Ait	*			
38	" nemoralis, Ait	*	*		
39	Eupatorium purpureum, Linn				*
40	Solidago uliginosa, Nutt	*			
41	Achillæa Millefolium, Linn		*		
42	Solidago Canadensis, Linn				*
43	Centaurea nigra, Linn		*		*
44	Nabalus serpentaria, Pursh	*	*		*
45	Leontodon autumnale, Linn	*	*		*
	XIV. CAMPANULACEÆ.				
46	Campanula rotundifolia, Linn	*			

No.		I.	II.	III.	IV.
	XV. ERICACEÆ.				
47	Vaccinium Oxycoccus, Linn	*			
48	" Vitis-Idæa, Linn	*			
49	" macrocarpon, Ait	*			
50	" Pennsylvanicum, Linn	*	*		
51	Chiogenes hispidula, Torr. and Gray	*			
52	Cassandra calyculata, Don	*			
53	Kalmia angustifolia, Linn	*	*	*	
54	Rhodora Canadensis, Linn				*
55	Ledum latifolium, Ait	*			
56	Pyrola secunda, Linn	*			
	XVI. SCROPHULARIACEÆ.				
57	Euphrasia officinalis, Linn				*
58	Rhinanthus Crista-galli, Linn				*
	XVII. LABIATÆ.				
59	Brunella vulgaris, Linn				*
60	Scutellaria galericulata, Ait				*
61	Galeopsis Tetrahit, Linn		*		
	XVIII. BORAGINACEÆ.				
62	Myosotis laxa, Gray		*		*
	XIX. GENTIANACEÆ.				
63	Halenia deflexa, Griesb		*		
	XX. POLYGONACEÆ.				
64	Rumex acetosella, Linn	*			
	XXI. EMPETRACEÆ.				
65	Empetrum nigrum, Linn	*	*		
	XXII. MYRICACEÆ.				
66	Myrica Gale, Linn	*			
	XXIII. BETULACEÆ.				
67	Alnus viridis, D C.				*
	XXIV. CONIFERÆ.				
68	Juniperus communis, Linn		*		
69	" Sabina, *var.* procumbens, Pursh	*			
	XXV. ORCHIDACEÆ.				
70	Habenaria tridentata, Hook				*
71	" dilatata, Gray	*			
72	Spiranthes Romanzoviana, Cham	*			

No.		I.	II.	III.	IV.
	XXVI. IRIDACEÆ.				
73	Iris versicolor, Linn		*		
74	Sisyrinchium Bermudiana, Linn		*		
	XXVII. LILIACEÆ.				
75	Clintonia borealis, Raf	*			
76	Smilacina bifolia, Ker	*			
	XXVIII. JUNCACEÆ.				
77	Juncus bufonius, Linn	*	*		
78	" Canadensis *var.* coarctatus, G	*			
79	" effusus, Linn	*			
	XXIX. CYPERACEÆ.				
80	Eriophorum vaginatum, Linn	*			
81	" Virginicum, Linn	*			
82	Carex sterilis, Willd				*
83	" crinita, Lam	*			
84	" vulgaris, Fries		*		
85	" canescens, Linn	*			
	XXX. GRAMINEÆ.				
86	Alopecurus aristulatus, Michx		*		
87	Agrostis vulgaris, With	*			
88	Agrostis canina, Linn	*			
89	Poa pratensis, Linn		*		
90	Festuca ovina, Linn		*		
91	Triticum repens, Linn				*
92	Aira cæspitosa, Linn		*		
	XXXI. FILICES.				
93	Asplenium Filix-foemina, Bernh				*
94	Aspidium spinulosum, Swz. *var.* Boottii. Tuck	*			*
95	" " dilatatum, Horn	*	*	*	
96	Onoclea sensibilis, Linn				*
97	Osmunda cinnamomea, Linn	*	*	*	
98	" regalis, Linn		*		*
	XXXII. LYCOPODIACEÆ.				
99	Lycopodium dendroideum, Michx	*			
100	" clavatum, Linn	*			
101	" annotinum, Linn	*			
102	" alpinum, Linn	*			
	XXXIII. MUSCI.				
103	Sphagnum fimbriatum, Wils	*			
104	" acutifolium, Ehrh	*			
105	Polytrichum juniperinum, Hedw	*			
106	" formosum, Hedw		*		
	XXXIV. LICHENES.				
107	Cladonia deformis	*			

Additional Plants from Labrador and Hudson's Strait.

After a careful examination of all the collections made by Dr. Bell in Labrador and on the shores of Hudson's Strait and Bay in 1885, Professor Macoun finds only the following five to add to the list of flowering plants obtained by him in these regions in 1884:—

1. Anemone parviflora, Linn, Port Burwell, Cape Chudleigh.
2. Anemone Hepatica, Linn, Ashe's Inlet, North Bluff.
3. Draba incana, Linn, var. confusa, Poir, Port Burwell, Cape Chudleigh.
4. Rhododendron Lapponicum, Linn, Nachvak, Labrador.
5. Primula farinosa, Linn, Nachvak, Labrador.

APPENDIX II.

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PARTIAL LIST OF INSECTS COLLECTED IN 1885, BY DR. ROBERT BELL, IN CONNECTION WITH THE HUDSON'S BAY EXPEDITION.

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LEPIDOPTERA,

DETERMINED BY H. H. LYMAN.

Papilio Brevicauda, Saunders. 1♀. St. John's, N.F. This specimen is interesting from the absence of fulvous from the upper side.

Papilio Turnus, Linn. 1♂. Taken at Topsail, N.F.

Pieris Napi, Esp.

Arctic form, *Bryoniæ*, Ochs. ♀, Summer form, *Acadica*, Edw. ♀. Taken at St. John's, N.F. The former is the spring form, and the latter the summer one. The two broods overlap, and specimens of both are thus taken flying together.

Pyrameis Atalanta, Linn. One specimen. St. John's, N.F.

Colias Pelidne, Boisd. Var. Orange ♂. Taken at Hyla on E. side of Hudson's Bay, 30 miles south of Cape Wolstenholme. This is the most interesting specimen in the collection, only one other Orange ♂ having previously been reported, as described Mr. Moschler in Wien. Ent. Mar. IV, p. 354 (1860).

Colias Nastes, Boisd. One specimen of rather small size. Taken at Cape Chudleigh, Hudson's Strait.

Argynnis Polaris, Boisd. Three specimens (2♂, 1♀), Cape Chudleigh. Three specimens, Cape Digges, Hudson's Bay.

Laria Rosii, Curt. Two specimens. Cape Digges.

Anarta Richardsoni, Curt. Two specimens. Cape Chudleigh.

Also several others not yet determined.

COLEOPTERA,

DEMERMINED BY DR. G. H. HORN.

(Per favor of W. H. Harrington.)

STUPART'S BAY.

Amara hyperborea, Dej. Over 100 specimens.
Pterostichus hudsonicus, Lee.
Hydroporus longicornis (occurs in Europe).
" *perplexus*, Shp.
Agabus longulus, Lee. (?) 50 specimens.

CAPE CHUDLEIGH.

Nebria sahlbergi, Fisch.
Amara hyperborea, Dej.
Lepyrus colon, Linn.

CAPE DIGGES.

Amara hyperborea, Dej.
Agabus longulus, Lee (?)
Criocephalus agrestis, Kirby.

BLANC SABLON.

Nebria sahlbergi, Fisch.
Pterostichus luczottii, Dej.
Quedius sublimbatus, *Mäkl.*