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GEOLOGICAL SURVEY OF CANADA.

REPORTS

OF

EXPLORATION AND SURVEYS

1872-73

GEOLOGICAL SURVEY OFFICE

MONTREAL, May, 1873.

SIR,—I have the honor to transmit, for the information of His Excellency the Governor General in Council, the accompanying Reports relating to the surveys and investigations of the Geological Corps during the season of 1872–73.

I have the honor to be,

Sir,

Your Obedient Servant,

ALFRED R. C. SELWYN,

Director of the Geological Survey.

To

The Honorable JOSEPH HOWE, M. P.,

Secretary of State for the Provinces,

OTTAWA.

SUMMARY REPORT

OF

GEOLOGICAL INVESTIGATIONS,

BY

ALFRED R. C. SELWYN, F.G.S.;

ADDRESSED TO

THE HONORABLE JOSEPH HOWE, M.P.,

SECRETARY OF STATE FOR THE PROVINCES.

SIR,—I have the honor to submit for the information of His Excellency the Governor General in Council the following Report of the progress made during the year 1872–73 in the Geological Survey of the Dominion, and in the Exploration of its mineral resources.

Regions in which explorations have been carried on.

In Cape Breton and in other parts of the Province of Nova Scotia, and also in the Provinces of New Brunswick, Quebec, Ontario, Manitoba and British Columbia, examinations and surveys have been made, most of which are in continuation and extension of the investigations of preceding seasons, and of which Reports have been presented, and are now published in the volumes issued for 1870-71, and for 1871-72 respectively.

Labours of Mr. Selwyn.

The greater part of my own time during the year has necessarily been occupied in the work incidental to the general supervision of the Survey, and much of it, during the early part of the winter, in attending to the printing of the Reports for 1871-72. In June I visited and examined the Acadia Iron Mines at Londonderry, Colchester County, Nova Scotia, for the purpose of investigating and reporting upon the character of the iron-ore deposits there, especially in reference to the probable extent of the veins and their permanence in depth. I also visited and examined parts of the Spring Hill coal-field in Cumberland County, Nova Scotia; the survey and exploration of which has occupied the attention of Mr. Scott Barlow during the past three seasons. The latter part of July and the months of August, September and October I devoted partly to investigations in the silver-bearing region around Thunder Bay, Lake Superior, and partly to a preliminary exploration westward from Lake Superior to Fort Garry, in which latter I was accompanied and assisted by Mr. Robert Bell. Relating to the explorations above named, the fol-

lowing reports have been received and are submitted herewith, together with the result of my own observations on the Londonderry iron mines, and on portions of the region explored between Lake Superior and Lake Winnipeg.

Additions to the palæontological collections.

In the palæontological branch of the Survey, Mr. Billings reports the following additions to the collections since the 1st of June, 1872 :—

	Specimens.
Presented by Major C. Grant, of Hamilton, fossils from the Hudson River, Clinton and Niagara formations.....	24
By Mr. F. W. Ramm, of Port Hope, one Orthoceratite from the Black River formation.....	1
Collected by Mr. T. C. Weston, from the Silurian rocks at Hereford and Farnham, about.....	200
From the Potsdam rocks at the Straits of Belle Isle, Labrador.....	500
From the Black River formation, Paquette's Rapids, Upper Ottawa.....	200
From the Upper Silurian rocks at Arisaig, Nova Scotia	300
Collected by Mr. Thos. Curry, from the Upper Silurian and Devonian rocks at Port Daniel and Percé, Gulf of St. Lawrence.....	2000
From the Hudson River rocks at Rivière des Hurons	191
Collected by Mr. A. H. Foord, from the Upper Silurian rocks at Port Daniel.....	200
Collected by Professor Baily, Devonian fossil plants from New Brunswick.....	41
Collected by Mr. G. F. Mathew from Upper Silurian rocks, New Brunswick.....	19
Collected by Mr. G. F. Mathew from Carboniferous rocks, New Brunswick (fossil plants).....	5
Collected by Mr. James Richardson, from the rocks of Vancouver and Queen Charlotte Islands, British Columbia..	947
Collected by Mr. Charles Robb, from the Carboniferous rocks of Cape Breton (fossil plants).....	28
Collected by Mr. Scott Barlow, from the Carboniferous rocks of Cumberland County, Nova Scotia.....	20
Total.....	4,676

Affinities of *Archæocyathus*.

In the collection made by Mr. Weston at the Straits of Belle Isle, there is a very fine series, including several species of the curious genus *Archæocyathus*. By slicing these for microscopic examination it may be possible to determine whether they should be regarded as sponges or corals, a point upon which there is at present much doubt.

The collection from Arisaig is especially valuable, as it contains a number of specimens which show the internal characters of the shell, such as the teeth and muscular impressions. These characters, which were wanting in the specimens previously collected, prove that many of the species from this locality, described in Dawson's Acadian Geology, are referred to wrong genera. In the examination and study of this collection, to which several weeks have been devoted, Dr. Dawson has afforded great assistance, by placing all his Arisaig fossils, including those originally described by Professor Hall, in Mr. Billings' hands for comparison. Without this assistance many of the species could not have been identified. It was proposed to publish the results already obtained in the first part of Vol. II. *Palæozoic Fossils of Canada*, which is now being prepared; and, with this object in view, Mr. A. H. Foord, the Artist to the Survey, has already figured a number of the specimens. On reconsideration, however, Mr. Billings thinks it will be better to defer publication until further collections have been made, and he has had an opportunity of examining the collections from the same locality which have been made by Dr. Honeyman, and are now in the Public Museum in Halifax.

Arisaig fossils.

Assistance from Dr. Dawson.

Publication of descriptions of fossils.

The large collections made by Mr. Curry afford many important additions to our knowledge of the Upper Silurian and Devonian rocks of the Gaspé Peninsula.

Mr. Curry's collections.

The Port Daniel collection contains a great many new species, and, including the collections previously made in the same locality by Sir W. E. Logan and Mr. Bell, supplies material which will occupy from seventy-five to one hundred pages of descriptive text in the second volume of the *Palæozoic Fossils of Canada*. The whole of these collections have been studied, and but little more remains to be done except to write the descriptions of the species. Before publication, however, a further collection is much to be desired.

The Port Daniel collections of fossils.

The careful study and comparison of the fauna of the Middle and Upper Silurian rocks around the shores of the Gulf of St. Lawrence, together with a better knowledge of the geological structure of the region, will probably elicit some interesting and important facts in connection with its earlier physical geography and geology. Bearing on these questions, Mr. Billings finds that, though the Port Daniel and the Arisaig rocks—respectively on the northern and the southern shores of the Gulf, and distant from each other about 250 miles—are certainly both of Middle and Upper Silurian age, yet that a very wide and marked difference exists in their respective faunas; and that both of these differ as widely from that of the Middle and Upper Silurian of New York and Western Canada as they do from each other; while that of the Gaspé limestones north of Cape Maquereau, and of the Middle Silurian rocks of the Island of Anticosti, corresponds exactly with the New York type.

Remarks on the Middle and Upper Silurian rocks of eastern America.

In the preceding Lower Silurian period, as also in the succeeding Devonian period, the respective faunas are alike throughout the regions referred to; thus, while doubtless a large part of the eastern area existed as dry land long prior to the close of the former period, as is indicated by the entire absence in it of all the upper members of the Lower Silurian series, which are so largely developed in the western area, yet the facts shew that the Upper Silurian period in eastern North America was preceded by oscillations of the surface, which resulted in the formation of barriers separating the eastern and western area, and limiting the distribution of their respective faunas, the eastern area being apparently divided by similar minor barriers; and further that the whole of these barriers were removed prior to the succeeding Devonian and Carboniferous periods.

At present neither the details of the geological structure, nor the distribution of the fauna of the regions affected by these movements, from the Gulf of St. Lawrence south-westward to the Atlantic shores of New England, are sufficiently well known to make it possible to indicate exactly the nature, position and extent of these ancient barriers. From the facts cited, however, it would seem that the altered rocks of Cape Maquereau, which are referred by Sir W. E. Logan to a part of the Quebec group (Geology of Canada, page 272), certainly formed a part of the main barrier between the eastern and the western areas. Its eastern extension will probably be found in Newfoundland; while, in the opposite direction, we have at present no certain evidence respecting it; though it seems probable that the greater part of New Brunswick and of eastern Maine would be included in the eastern area.

British Columbia fossils.

Of Mr. Richardson's large and valuable collection from British Columbia a preliminary study of the ammonites from the Queen Charlotte Islands has been made. Among them there are seven species which belong to the groups *Planulati* and *Macrocephali*, characteristic of the Bath and Coralline Oolite of England, and of the Brown Jura on the European continent. Judging from the ammonites alone, it would appear that some of the Queen Charlotte Islands rocks are Jurassic, and therefore occupy a somewhat lower horizon than those of Vancouver Island, the fossils from which have been determined to be Cretaceous. Until further study and comparison have been made of the whole of the collection, which contains a large number of genera and species, it will, however, be impossible to arrive at any definite conclusion respecting the relative age of these rocks. A noteworthy fact, however, is that not one of the seven species of ammonites above referred to has yet been found either in California or on the east side of the Rocky Mountains.

Lower Potsdam fossils.

Besides the study of the Gaspé, Arisaig and British Columbia fossils, considerable time has been devoted to the further study of the fossils of

the Lower Potsdam rocks; the result of which will form a portion of the first part of Vol. II, *Palæozoic Fossils of Canada*, which will also contain figures and descriptions, chiefly of new species, from the Upper Silurian limestones and Lower Devonian sandstones of Gaspé, as well as the results of other palæontological investigations which have already been published in part in some of the scientific serials of Europe and America.

Acknowledgment of Dr. Dawson's labours.

Dr. Dawson has kindly devoted considerable time and labour to the study and determination of the very interesting collection of fossil plants brought by Mr. Richardson from Vancouver and Queen Charlotte Islands; and he has also again given his valuable and gratuitous labour to the Survey in the preparation of a volume which will shortly be issued, containing illustrations and descriptions of the fossil plants of the Lower Carboniferous and the Millstone Grit formations of Canada.

Mr. Weston's work.

During the winter Mr. Weston has done a large amount of valuable work, in cutting out, cleaning and ticketing fossils collected by himself and others. This work occupies much time, and requires great practice and more than ordinary skill. A large part of Mr. Weston's time has also been devoted to the preparation of slices of various fossils and rocks, the characters of which could only be determined by microscopic examination. Amongst these may be mentioned eighty-nine mounted sections of the fossil plants from British Columbia. Also upwards of 200 similarly prepared slices of various fossiliferous rocks from the Eastern Townships and elsewhere. Mr. Weston has also devoted some time and attention to photographic work, with a view to facilitate the labours of Mr. Billings and Mr. Foord in describing and figuring organic remains. Besides other negatives he has succeeded in producing some very excellent micro-photographs, shewing the structure of the fossil plants from British Columbia on an enlarged scale, which will materially aid Dr. Dawson in the labour he has, as above stated, kindly undertaken in connection with the examination of this highly interesting fossil flora.

Fossils submitted to Mr. Meek.

Mr. Billings has submitted some of the fossils from British Columbia to Mr. Meek, who is well known as the highest authority on the fauna of American Secondary formations. Mr. Meek's and Mr. Billings' observations on the fossil animals, as well as Dr. Dawson's on the plants, appear as appendices to Mr. Richardson's Report.

Since the retirement of Dr. T. Sterry Hunt at the close of last year, the chemical and mineralogical investigations of the Survey have been intrusted to Dr. B. J. Harrington, assisted by Mr. Christian Hoffmann. Respecting the work in the laboratory, Dr. Harrington reports as follows:

Work of the chemical laboratory.

"Our laboratory work has consisted largely in the examination of economic minerals from different parts of the Dominion, and much useful information has been accumul..ted.

Examination of iron ores.

"Thirty-two specimens of iron ore from different localities have been examined. In nine cases the analyses were complete. In eleven others, sufficiently so to determine the value of the ores, while in the remaining twelve, only determinations of iron were made. A sample of the bar-iron made from the ore of the Acadia mines has also been examined for phosphorus.

Gold, silver and copper.

"Thirty-two specimens of quartz, mispickel, pyrites, &c., have been assayed for gold and silver, and six specimens for silver only. Fourteen of the samples are from the township of Marmora, and the results of their assay shew a great variation in the quantity of gold in different veins, as well as in the same vein at different depths. The highest yield of gold obtained was 4.90 ounces to the ton of 2,000 lbs., the highest yield of silver to the ton did not exceed 50 cents. Samples from a few localities near the line of the projected Canada Pacific Railroad between Lake Superior and Red River have been examined, but in most cases were found to contain little or no gold or silver. Assays have been made of forty-five samples of copper ore, all, except one, being from localities in the Eastern Townships.

Phosphate of lime.

"Twelve specimens of phosphate of lime have been examined for the information of persons interested in the development of the deposits of this mineral.

Coal.

"Proximate analyses have been made of twelve samples of coal, ten from Cape Breton, and two from British Columbia. The examination of the former coals shews them to contain a very small amount of ash, but a large percentage of sulphur. The average percentage of ash in the ten samples was 3.14, and the average percentage of sulphur 2.05." The analyses of the samples from Cape Breton appear in Mr. Robb's report submitted herewith.

"A series of the coals from Vancouver and Queen Charlotte Islands are now being analysed and the results will soon be ready for publication.*

Minerals and rocks.

"Many minerals of scientific interest have been identified by means of the blow-pipe, and among them there are three which do not appear to have been before observed in the vicinity of Montreal.

"Complete analyses have been made of twelve specimens of rocks and minerals from different parts of the Dominion, and partial analyses of three others. Among the rocks analysed is a serpentine from Lake Abbitibbé which contains both chromium and nickel. An analysis of the green pebbles in a specimen of the Lower Carboniferous conglomerate from Harvey settlement, New Brunswick, shews that they consist of a hydrated silicate of alumina with several per cent of potash and soda.

Brine from Nanaimo.

"The analysis of a brine from Nanaimo, in Vancouver Island, is being made by Mr. Hoffmann."

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* See *Appendix III.* Mr. Richardson's report.

A report has also been received from Dr. Harrington, and is submitted herewith, of an examination of samples of brick-clay from Fort Garry, made with special reference to their suitability, and to their proper treatment, for the manufacture of bricks. These clays were sent to the museum by Mr. J. S. Hargrave, and were accompanied by the following memorandum : Report on brick-clay from Fort Garry.

" Specimen No. 1. Surface clay, dark. When mixed with Nos. 2 and 6 makes a white brick with Townsley's machine.

Specimen No. 2. From three feet deeper than No. 1 ; when mixed with Nos. 1 and 6, makes a white brick with Townsley's machine.

Specimen No. 3. Sometimes found mixed with No. 2, but oftener about seven feet below the surface. Has been worked with a Chicago steam machine without sand or water. This brick has been a total failure.

Specimen No. 4. Found from fifteen to twenty feet deeper than No. 3. This is the deepest clay known in Manitoba. Mixed with No. 3, has made bricks with a Chicago steam machine without sand or water. Brick a failure hitherto.

Specimen No. 5. Sand from Point Douglas.

Specimen No. 6. Do. from near Silver Heights."

From Dr. Harrington's report on the above named samples, it will be seen that the want of success in the manufacture does not arise so much from defects in the clays, as from the manner of treating them, both in the preparing and in the burning.

I have the honor to be,

Sir,

Your obedient servant,

ALFRED R. C. SELWYN.

Montreal, May, 1873.