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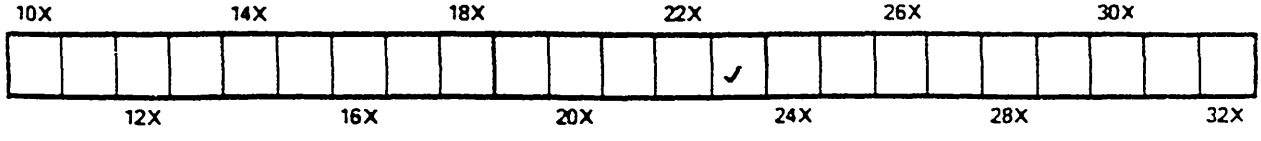

ANNUAL MEETING—TUESDAY, MARCH 14th, 4 p.m.

January—March, 1890.

THE OTTAWA NATURALIST

VOLUME III. No. 4.

The Transactions Of the Ottawa Field-Naturalists' Club

(Organized March, 1879. Incorporated March, 1884.)

CONTENTS.

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NOTICE.—The Treasurer begs to call the attention of members to the advertisements.

EDITORIAL.

The present number brings to a close the third volume of the OTTAWA NATURALIST. The favourable notices which have appeared in current periodical literature have been very encouraging, and the demands for numbers from outside naturalists—which are constantly increasing—are evidences of the growing appreciation of our efforts. The experiment was tried during the past season of publishing the magazine in quarterly instead of monthly parts; but so many of our subscribers have expressed regret at this change in the method of publication, thinking that much greater interest in the work of the Club is kept up by the monthly issue of the proceedings and notices of meetings, that the editor has felt it his duty to request the Council to bring the advisability of returning to the monthly issue before the Club for consideration at the next annual meeting, which will be held in the museum of the Ottawa Literary and Scientific Society on Tuesday afternoon next, 18th March, at 1.15 p.m. There are several matters of unusual importance to come before the meeting, and the Council is particularly anxious to have a large attendance. Amongst other matters of great interest to the Club, upon which the members will be asked to express their views, is one provided for last year, to wit, the addition of three lady members to the Council. This step it is considered will materially increase the usefulness and popularity of the Club. It is most desirable that there should always be a good representative attendance at the annual meetings for many reasons; but particularly so when changes of importance are made in the management such as that which is now proposed. Owing to the high class of papers which have been read before the Club during the past winter, most of which are already in the hands of the editor, the numbers of the NATURALIST for the coming year will be of exceptional interest. The usefulness of the Club as an educational institution and as a means of providing beneficial and enjoyable recreation is generally acknowledged by all who have had their attention drawn to it. The editor begs to thank the members of the Club for the assistance and encouragement they have given in the past. There are, however, two things in which every member of the Club can render signal service to the editor

without putting themselves to inconvenience. These are (1) by increasing the membership of the Club. There are few people who have not, at any rate, one friend, who "for their dear sakes" would give a dollar a year to a good cause. If every member of the Club would obtain one new member, the OTTAWA NATURALIST would then be made the most successful Natural History Magazine in North America. (2) By paying their subscriptions *when they are due* at the beginning of the Club year (3rd Tuesday in March). The subscription is necessarily payable in advance, because all payments for printing the NATURALIST, rent of rooms, postage, stationery and binding, have to be met as they fall due, and our only sources of revenue are the dollar a year paid by each member and the advertisements on the cover of the NATURALIST. Moreover, the advantages offered by the Club are so considerable that it is seldom so much can be got in return for a dollar. *Lege et mirare!!* The OTTAWA NATURALIST is sent free, as issued, to every member; admission is free to all the evening lectures and popular afternoon lectures; there is a reduction in the price of tickets at all the excursions, which alone frequently amounts to a saving of half the annual subscription; the back publications of the Club are now furnished to members at the actual cost of printing, a saving in those already printed (from the published prices) of $2.56;—Is not this enough for a dollar? If not, come to the annual meeting and tell us in what else we can meet your wishes.

In conclusion, the editor begs to tender his sincere thanks to Mr. W. A. D. Lees for his most timely and valuable help as assistant editor during the year. J. F.

———:o:———

AGRICULTURAL GRASSES AND FORAGE PLANTS OF THE UNITED STATES BY DR. G. VASEY.

The new and enlarged edition of Dr. Vasey's Agricultural Grasses has been received. It is a large pamphlet of 148 pages and is illustrated by 114 plates. The printing and get up of this work are of the usual excellent quality of the United States documents. It is largely a revised edition of that of 1884; but much valuable new information has been added. In the present report the principal forage plants, other than grasses, which are employed in agriculture, are treated of. The plates are very fine and will be invaluable to those wishing to make a study of grasses. Pl: 1-4 are devoted to illustrating the different parts of grasses, and a glossary of the terms used in describing these plants is given. J. F.

GEOLOGICAL PROGRESS IN CANADA.

PRESIDENT'S INAUGURAL ADDRESS.

BY R. W. ELLS, LL.D., F.G.S.A.

(Delivered Dec. 13th, 1889.)

Mr. Chairman, ladies and gentlemen, in opening the present series of soirees and lectures pertaining to the Ottawa Field Naturalists' Club, I can only regret that the task has not fallen on some one of its many members, who from a larger and more intimate acquaintance with the work and aims of the Society, would have been much better fitted to present its claims and to advance the subject in all its bearings. As, however, accident or design has placed the responsibility on my shoulders I will attempt to lay before you, briefly, a few facts bearing upon the Club's actual condition, and strive to indicate what, under proper and wise guidance, and with a due manifestation of interest on the part of its members will conduce to the undoubted successful future to which the Society should do its utmost to aspire.

Established in 1878 by a small body of enthusiastic amateurs in the study of the various branches of Natural History, this Society has grown steadily in public favor, till now we are happy to point to a membership of not far from 250 persons. Among these we are proud to be able to number many of our best and most enterprising citizens, both ladies and gentlemen. We include in our list, I think, nearly or quite all those whose tastes and inclinations have led them to desire a more intimate acquaintance with the wonderful and beautiful things of nature, either through the agency of the regular excursions which are held during the summer months, or through the lecture courses in which many of the notes and facts then obtained are presented in attractive form, and in a manner in many respects probably more instructive. Of our members, while many may not lay claim to the title of scientists, in the strict acceptation of the term, it may be said, that, by some, at least, much excellent and lasting work in the cause of science has been accomplished, as can be readily seen by reference to the published volumes of the Club's Transactions; while of many others it may be safely asserted that a large store of valuable notes and obser-

vations have been made by them on the various subjects of natural history, the results of which have not yet been presented to the society, possibly for the reason that in many persons a certain innate modesty or a lack of confidence in their own powers has heretofore restrained them from taking a more active part in the work or discussions of the Club. To bring such members more fully into the light, and to secure their hearty co-operation and valuable assistance, and to provoke a spirit of enquiry generally, on their part, concerning the beauties which lie around us on every hand, is one of the first aims of this institution. While we acknowledge that much has already been done in this direction, our hopes will not have been fully realized till we see far richer results.

It may not be generally known that in our membership we now include the greater portion of the official staff of the Geological and Natural History Survey of Canada, comprising a body of men eminent in many branches of science and well known throughout the scientific world. And in this respect we are, as a club, clearly in advance of any other similar scientific institution at least in Canada, if not in the adjacent country of the United States. Of these it may be said that while for well recognized reasons the chief result of their observations, in the field or otherwise, may not be directly available to us as a private institution, many important, interesting and valuable facts bearing on the several branches of natural history and geology, as well as sketches of explorations of our hitherto but little known and vast stretches of territory, can be presented at our meetings and incorporated in the Club's Transactions, thus rendering this publication one of the most valuable of the scientific journals published in any country. I cannot but feel that in this Club, as at present constituted, we have a membership sufficient to entitle us to a very high position among scientific institutions at large, and that it, in reality, depends upon ourselves to make the Ottawa Field Naturalists' Club a true power in the land, and its published Transactions of such value as to be eagerly sought after by scientists and those interested in science generally all over the civilized world. I am impelled or rather authorized to say this, more particularly at this time, in view of the fact that up to the beginning of the present year, according to a clause in the late constitution of

he Club, its operations were almost entirely confined to scientific work in the more immediate vicinity of Ottawa. By this clause it can easily be seen that the work of most of the active members of the Geological Survey, whose fields of research lay at points remote from this city, was almost entirely excluded, and as a necessary consequence the members of that staff, who should constitute a very important factor in the successful working of the society, to a very large extent lost interest in the Club's work as a whole. By a unanimous vote at the last general meeting this clause of the constitution was amended in order that the scope of the Club's work could be enlarged and embrace the reading of papers, discussions and observations by any of its members on subjects of scientific interest from any portion of the Dominion, and a glance at the programme prepared for your entertainment and instruction during the coming winter will show you at once the direct practical outcome of this modification of the Club's policy, since it will there be seen that no less than six papers, all of which promise to be of great interest, and comprising localities which extend from Labrador on the east to the Arctic Circle and the great Yukon Country on the west and north, will be read by members of the Geological and Natural History Survey of Canada, and it may be said here that only the lack of time or opportunity at our disposal has prevented the obtaining of others of equal interest and importance from the same source.

With, therefore, such an array of facts as we have just stated, and with so attractive a programme as we are now enabled to present to the members of the institution and to the general public as well, it is most confidently anticipated that much of the indifference, or lack of interest, to use a milder term, which has apparently been evinced by many members in the working of the society, will now disappear. The programme of papers and lectures for our present course is of such interest and importance as in any other town or city would attract so great an audience that our present room would be inadequate for their accommodation, and I can but feel, and so feeling, strive to impress upon every member of the Ottawa Field Naturalists' Club, the great desirability of placing the society of which we are all members in so distinguished a position that every one of us can point with gratification

to the fact that he is a member of this body of earnest workers in the cause of science generally.

Concerning the work of the summer just past, I can or need say but little. The several excursions were very successful, well attended, and enjoyable, and many facts new to members were obtained. The study of Nature in the field is, after all, the only true method in which we can obtain a correct knowledge of her mysteries. Many a geologist can, in his office and at his leisure, write learned dissertations on the geological structure of a country about which but little is known, which may, indeed, read very well and seem perfectly plausible, but which, upon actual test in the field, in some way do not appear to meet all the requirements. It is, in all scientific work, only by "thought and din[t] of hammering," as one of our members so happily puts it, that the fundamental truths can at length be reached. Ornithology, botany, entomology, in fact all the branches of natural science acquire a tenfold interest when their study is taken up in direct connection with the objects studied, but when, by this study in the field, we have obtained all the facts possible bearing on the subject, then comes the perfecting process by their careful and minute study indoors. It is this feature in the working of this Club, as originally contemplated, which, though possibly at times lost sight of, renders this Society so valuable, since it carries on, or at least endeavors to carry on, its work exactly in this way, and it is precisely for this purpose that the evening soirees were at first inaugurated, that members who have spent the months of summer in collecting facts, may have an opportunity of presenting these before the membership of the Club, and may receive needed information or light upon any point that may appear to them puzzling or obscure. The accounts of the several excursions, and the results attained, will be found embodied in the several numbers of the Club publications for the past summer, and it is, therefore, needless for me to further refer to them here, since we infer that every member has long ere this carefully read the contents of each number as it appeared.

It may not be out of place here to refer to one aspect of scientific work, the consideration of which has a very important bearing on the question generally. Many persons have asked me, as they have doubtless asked every student of Nature in her many forms: What is the

practical outcome of all this? What benefit, direct or indirect, do we, as a people, expect to derive from such an expenditure of time or money on the part of the individual or of the nation? Now, while to a body of strictly scientific workers the consideration of such a question would be quite unnecessary, it is possible that there may be, even here, some who have thought over this question from this practical standpoint. And, first of all, I suppose it may be safely asserted that every scientific subject has a twofold aspect, viz.: first, its study from a purely scientific point of view and in the interests of science properly so called; and, secondly, its economic importance. Thus, if you were to ask the entomologist what practical good he expects to derive from the study or serious contemplation of bugs or insects, he would readily say that many of these insects are injurious to the growth or development of certain valuable fruits or grains, and the study of their habits, their methods of existence, and the means by which their destruction can best be effected, forms an exceedingly important branch of study, in order that their encroachments may be most successfully resisted or their extermination most readily effected. So, also, with the ornithologist, the study of the habits of certain birds, injurious or otherwise to vegetation, as in the case of the English Sparrow or other species, is considered so important that special investigations in this direction have been undertaken by our neighbors across the line. As regards the problems of geological science, the economic aspect of the question is of special value in many ways; since upon the character of the rocks beneath the surface depends very largely the agricultural value of soils which have been produced by their disintegration or decay, and the determination of areas suitable for successful settlement and their fitness for the growth of certain important classes of food products. The determination of mineral-bearing belts, and the probabilities of the profitable expenditure of capital in the search for economic minerals, also in great measure depend upon the correct determination of geological horizons, and constitute one of the most important of the practical problems presented by the study of the science of geology. With many of those who regard scientists, as a class, simply as cranks of a higher growth and as persons who have no clear conception of the objects for which they are working, it is very evident that the consideration of these

aspects of the question has never entered into their calculations, since the resulting benefits, even in the pecuniary sense, to every form of industry now known, not merely in those more especially connected with the study of the natural sciences, but in those which enter more closely into the avocations of every day life, have only been obtained by dint of hard, close and unremitting study of Nature's secrets by some one of those so called cranks, whose greatest and sometimes only reward very often is the inward satisfaction derivable from the thought that he is at least doing something for the general good of man, to advance the general interests of his country, or render more immediately and readily available the boundless stores of wealth which our great mother earth holds treasured up in her capacious bosom.

It has been suggested that for this opening paper some account of the progress of geological work in Canada might be acceptable. I need not say here that the exposition of such a subject, to give it any small measure of justice, would require a length of time much better measured by hours than by the few minutes at my disposal this evening, even were I in a position to discuss a subject of such magnitude, a subject the extent of which is only equalled by the greatness of our country itself. The only thing I can, therefore, hope to do in such a case is to give you some slight idea of the early work and of the workers who have labored in this field, to sketch briefly the outlines of the investigations carried on by the members of the Geological Survey and by others who have contributed in greater or less extent to the unravelling of some one of the many problems of geological structure which are everywhere presented, and to point out, if time permits, some few of the difficulties that yet remain to be overcome in order to arrive at their final and satisfactory elucidation.

For this purpose, the progress of geology in Canada may perhaps be divided into three parts, the first of which may be held to include the work done before the establishment of the Geological Survey; the second, that of the period in which the late Sir William Logan directed its operations; and the third, that of the last twenty years, during which the present director, Dr. Selwyn, has filled that position.

The writings of the early explorers in Canada, say in the latter part of the last and the beginning of the present century, do not contain

very much relating to its geology. While some notice was taken of the occurrence of some of the best known minerals, such as iron and coal, no attempt was made in any way to interpret the structure or explain the general geological conditions which prevailed. This can easily be accounted for from the fact that the study of the science at that date was in its earliest stages, and even in England and on the continent of Europe, the discussion of geological problems was attended with but small satisfaction. The formation of the Geological Society of London, in 1807, furnished a starting point for better work and more careful observations, and marks the beginning of the era when the study of the various rock formations may be said to have been undertaken in the right spirit. In Canada itself the conditions of geological study were somewhat peculiar. Prior to Confederation, each province, with the exception of Ontario and Quebec, controlled its own affairs in this direction, and although the present Geological Survey was established nearly fifty years ago, or in 1842–3, its operations were for twenty-five years almost entirely confined to the provinces mentioned. Before this date, however, individual explorers, or rather observers, prominent among whom may be mentioned the names of Bigsby, Bayfield, Bonnycastle, Ingall and Lyell, had, in the course of their wanderings, begun to study in some detail the character of the various rock masses encountered, and their papers, communicated to the Geological Society of London and to the Literary and Historical Society of Quebec, constitute the first literature on the subject of Canadian geology. Of these, in so far as I can learn, the earliest geological description of any section is contained in a paper read by Dr. Bigsby, in London, in 1823, and published in the Transactions of the Geological Society, in 1826. on the "Geography and Geology of Lake Huron," in which the character of the rocks about the great lakes and at various points along the north side of the St. Lawrence was described. In this paper the rocks are simply divided into the *Primitive*, a term which was held to embrace much or all of what we now regard as Laurentian and Huronian, or at least Archean, and the *Secondary* or stratified portion: the present arrangement of geological systems of nomenclature not having been invented till some years later.

The entire list of papers published on the geology of Canada proper, or old Canada, prior to 1843, numbered about fifteen. Of these two were by Dr. Bigsby, two by Capt. Bayfield, R. N., two by Capt. Bonnycastle, R. N., and six by Lieut. Baddeley, R. E., so that it may be said that our geology of that time was largely in the hands of the army and navy. That much of the work then done was of a high order is evident from the tributes subsequently paid to these observers by Sir William Logan, who, in the preface to the Geology of Canada, 1863, speaks of them as follows:

"Admiral Bayfield has communicated to the Literary and Historical Society of Quebec and to the Geological Society of London various interesting papers on subjects connected with Canadian geology, with the facts in which it will be found that we have on several occasions availed ourselves.

"Among the pioneers of Canadian geology no observer was more accurate than Dr. J. Bigsby, Secretary to the Boundary Commission under the Treaty of Ghent. His range of investigation extended from Quebec to Lake Superior, and beyond the limits of the province in that direction, and he has accumulated and published a great store of facts upon the exactness of which the greatest reliance can be placed.

"Lieut., now Major-General, Baddeley, of the Royal Engineers, when in Canada, now nearly forty years since, was an ardent promoter of geological enquiry, and his services were made available by the Provincial Government in explorations in the region of the Saguenay and in the Peninsula of Gaspé. To him we are indebted for the first published notices of the lower Silurian limestones of Lake St. John, Bay St. Paul and Murray Bay, as well as of the existence of gold in the drift of the Eastern Townships. Lieut. F. L. Ingall was another explorer who, about that time, did good mineralogical service in Government expeditions; the district to which his attention was directed being the country between the St. Lawrence and the Ottawa. Capt. R. H. Bonnycastle, R. E., at a somewhat later period, interested himself in the examination of various mineralogical and geological phenomena, more particularly in the neighborhood of Kingston, where his military duties had placed him. The results of his observations were given in

Silliman's Journal, 1831, and in other publications, and have been cited in this report."

Of the work of other observers, we have, in 1827, valuable notes by Dr. J. Richardson, who accompanied one of the Franklin expeditions to the north coast of America. In 1837, Mr. J. Roy, of Toronto, presented a paper, the first of its kind, apparently, on the superficial geology of Western Canada, in which he estimated the subsidence, from the evidence of terraces, at about 1,000 feet below the present sea level. In 1840, also, Mr. Kenwood gave some very interesting facts on the geology of northern New Brunswick, discussing the distribution of the granites of that area, the extent of the great carboniferous basin, and the presence of fossiliferous sediments about the Bay of Chaleur. But perhaps the most important paper at the close of this period was that by Sir Charles Lyell, in 1843, on the recession of the Falls of Niagara, embodying the results of a careful study of the peculiar conditions there presented; a paper often quoted since by writers on the subject of denudation and the geological history of the great lakes. This was followed in the same year by the first paper of Sir William Logan on Canadian geology, in which he described the distribution of Laurentian boulders along the St. Lawrence below Montreal and the presence of marine shells in the clay in the vicinity of that city.

The papers above enumerated may, as already suggested, be regarded as constituting the first period in the history of Canadian geology.

Before proceeding to the consideration of the work of the second period, or that embraced by the work of the Geological Survey under Sir William Logan, we may briefly glance at the history of explorations carried on in the provinces of Nova Scotia and New Brunswick, to which provinces the regular working of the Survey was not extended till the year 1868. During the period between 1830–40, Dr. Abraham Gesner, a well known physician of Nova Scotia, and celebrated even at that date as an ardent enthusiast in the study of the science of geology, began the study of the rock formations of that province. The conclusions he arrived at, after some years' investigation of the subject, were, in 1836, presented to the public in a volume entitled "Notes on the Geology and Mineralogy of Nova Scotia," a book possessing much

interest even at the present day. Dr. Gesner was not only a man of very distinguished ability, but a very close observer. He divided the rocks of the province into four grand classes, of which the first, and presumably the oldest, group was styled the primary, following the generally accepted nomenclature of that day, which he held to occupy the entire southern side of the province along the Atlantic sea-board. These were flanked throughout a great part of their extent, on the north-west, by a belt of clay-slates, or argillites, extending from the western extremity to the extreme north-east point. This area he included under the head of the clay-slate district. His third division, that of the red sandstone, embraced largely the great areas of the carboniferous system, and what is now regarded as the triassic, lying to the west and north of the preceding, while his fourth, or trap, district included a considerable extension of eruptive rock which forms the chain of the North Mountains along the south side of the Bay of Fundy and about the lower portion of the Basin of Minas, of special interest, both then and now, as affording some of the finest specimens of zeolitic minerals anywhere to be obtained.

While it may be generally stated that the structure of the province, as thus outlined by Dr. Gesner, has not been confirmed in every particular by the work of more recent observers, it must be said that many highly interesting points were brought forward, and have been sufficient to warrant the placing of Dr. Gesner's name in a prominent place among the earlier workers in the field of Canadian geology. He next took up the work in the adjoining province, New Brunswick, and, in a series of reports extending down to 1845, presented, likewise, a very fair summary of its structure and mineral wealth, a work, in fact, that for many years was accepted as the standard for that section. By him, also, the first geological maps of the two provinces were prepared, and it is a sad commentary upon human life to know that the closing years of a man so celebrated for scientific research, instead of being filled with the honours he so richly deserved, were embittered by neglect and poverty, insomuch that, through inability to meet some petty pecuniary liability, he even suffered incarceration in the common jail, and had it not been for the kindness of some one of his friends who chanced to hear of his position and procured his release, the closing hours of his life

would have been spent within the confines of the prison. Dr. Gesner evidently lived in advance of his day, but this sad ending of a life which had done so much to further the interests of the country will always stand out prominently as a bitter reflection upon the public men who permitted such a state of affairs to exist, could it possibly have been prevented.

Before leaving our sketch of Gesner's work, we may briefly call attention to his second volume on the "Industrial Resources of Nova Scotia," published in 1849. In this he expresses his indebtedness to several scientists, among whom were Messrs. Jackson and Alger, of Boston, and Sir. Charles Lyell, from whose conclusions, in some respects, Gesner continued to differ. As indicating the great advance in the science, as compared with the map of 1836, it may be said that in the volume of 1849 Gesner then divided the rocks of the province into no less than eight groups, of which the first, or primitive, rocks are now styled granite or hypogene; the second, or the non-fossiliferous stratified rocks, the Cambrian, corresponding largely to much of his former clay slate division; third, the Silurian, containing characteristic Silurian fossils and resting in small areas on the flanks of the former; fourth, the Devonian, or old red sandstone group; fifth, the Carboniferous, or coal formation; sixth, the old red sandstone, now our Triassic; seventh, Igneous, or intrusive, rock; and, eighth, the Drift, or Boulder, formation. It may be said of this work that many of the conclusions then advanced are accepted even at the present day.

Although, as just stated, the operations of the Geological Survey did not for many years extend to this province, almost the first work done by Sir William Logan, in 1843, was the examination of the Cumberland coal field and the measurement of his famous Joggins section, a work that has ever since remained as a standard by which the rocks of other portions of the Nova Scotia Carboniferous formation can be measured, even to the present day. In the meantime, the study of the science in this direction had not been entirely neglected. Sir Charles Lyell carefully examined various portions of the province and the adjoining Island of Prince Edward, and, as a result of his travels, presented papers of great interest to the London Geological Society. But another Nova Scotian was now coming rapidly to the front, a man

whom we are all proud to recognize as one of the most prominent, not only among Canada's, but the world's scientists, who, as the labors of Dr. Gesner drew to an end, took up the work with renewed enthusiasm. In the course of his travels throughout the province in the discharge of his duties as Superintendent of Education, Dr. Dawson, now Sir William Dawson, acquired a store of facts concerning the character and distribution of the various geological formations far greater than Dr. Gesner had been able to obtain. These facts were elaborated in much greater detail than was possible by his predecessor, owing to the great and rapid strides which had been taking place in the history of the science, and were, in 1855, presented to the public in the first edition of that celebrated work, the "Acadian Geology." It is not, probably, too much to say that while Logan was so successfully carrying on his great work in old Canada, Dawson, unaided, in his little province by the sea, was doing work equally as faithful and as productive of great results, and not only as the author of "Acadian Geology," but as a worker in many other fields of science as well, the name of Sir William Dawson will always stand prominent in the records of the science in Canada so long as the study of Canadian geology exists. No one who has ever studied carefully that great work on Nova Scotian geology as contained in the last edition of the volume we have mentioned, can fail to be impressed with the immense amount of painstaking research visible throughout. Not only is this seen in the matter of stratigraphical detail, but in the enormous amount of paleontological data there contained. Of the studies of Sir William Dawson of the fossil floras of the great Nova Scotia coal fields, and of the great amount of labor bestowed upon the paleo-botany of the Devonian system of New Brunswick and Gaspé, it need only be said that these remain and are accepted as standard works on these subjects everywhere at the present day. In the pages of "Acadian Geology," also, we find an abundant store of facts pertaining to the character and distribution of the fossils from every formation from the primordial Silurian to the Triassic. His work was not, however, confined to the one province of Nova Scotia. The assistance he was able to render to the local geologists who were beginning to decipher the complicated problems of structure in the adjoining Prov-

ince of New Brunswick was of the greatest value and greatly simplified the difficult task they had undertaken.

In connection, also, with the work in Nova Scotia, we must not omit to mention the names of others who have done great and lasting work in that field. Brown, on the structure of the Cape Breton coal fields, Hind, Howe, Honeyman, and others, of the latter of whom it may be said that probably no man was held in greater esteem by the people of his province. His work in the eastern area, on the Arisaig section, has long since established his reputation as a skilful worker in this field.

In speaking of the work of these pioneers of the science in our sister provinces, there should be no attempt to throw discredit upon their labors or conclusions, even though it be found that the results of the most recent investigations in this field do not in all respects coincide with theirs. It is but fair to infer that, with increased study and more detailed methods of examination, many new facts will be brought to light, which will often of necessity involve changes in the interpretation of structure. This has always been the case, and always will be, so long as the study of geology is carried on, and the principle is as true to-day, as applied to geological work, as it was twenty or thirty years ago.

Passing now to New Brunswick, we find there some names which, as having taken a prominent place in the early study of the science, are well worthy of mention. Among these we again find the name of Gesner prominent, and he may be well styled the father of New Brunswick geology. Following him, we have Dr. John Robb, a former professor in the University of Fredericton, who, in 1849, published valuable notes, and a map of the province, while reference to certain interesting points of structure was made in the first edition of the "Acadian Geology," in 1855. During the early years of its study, from 1840 to 1860, sufficient was not known concerning the areas of crystalline rocks in the southern part of the province to determine their true age or position. The fossiliferous Cambrian slates about St. John had not then been studied with any attempt at detail, only a few imperfect remains having been obtained, which were not determinable, while, from the comparatively isolated condition of the country, opportunities of comparison with the established Huronian and Laurentian rocks of

Canada were not sufficiently afforded to be of much value. At this date, however, 1860, three names come prominently into view in connection with the geology of the province, viz., those of Hartt, Bailey and Matthew. These gentlemen began a careful study of the rock formations about St. John and soon obtained large collections of fossils from various points, many of which were handed to Sir William Dawson for determination, and his papers on the subject form the basis of the second stage of New Brunswick geology.

In 1862–63, Hartt, after a careful study of certain fossils from the St. John slates, discovered the fact that these were the equivalents of those which had been determined by Barrande, in Bohemia, as characteristic of the primordial or earliest known fossiliferous zone. This discovery of Hartt's was of the greatest importance, as establishing a scientific basis for the determination of the sequence of strata. The conclusions then arrived at were published in a small volume issued by Bailey on the geology of the southern part of the province, and, as a result, the crystalline rocks, which resembled in many respects those of the oldest formations in Canada, fell naturally into their proper place at the base of the geological scale, and upon this foundation the superstructure of New Brunswick geology was speedily reared.

The last paper published on the geology of this province, prior to the extension in that direction, of the work of the Geological Survey, was by Prof. H. Y. Hind, in 1865, in which he dealt very fully, not only with the geological structure as a whole, but devoted much attention to the consideration of its mineral resources. In this paper, Prof. Hind instituted some comparisons between the rocks of the interior and those of eastern Quebec, or that portion known as the Quebec group, but differed in some respects from the opinions expressed by Bailey in his volume of the previous year on the southern portion of the province, as to the age of the rocks which had been found to underlie the Cambrian fossiliferous sediments.

The Geological Survey of Canada, whose operations have now been extended to every part of the Dominion, has had an existence of nearly fifty years. While it may seem almost superfluous to devote any time to the history of its inception, it is possible that there may be some present who are not perfectly familiar with the early struggles and dis-

appointments, which attended the efforts of those who were desirous of seeing such an institution in successful operation, and who firmly believed in its great utility as a factor in the advancement of the interests of the provinces. As far back, then, as January, 1832, a petition, asking for pecuniary assistance in carrying on a geological and statistical survey, was presented by Dr. Rae to the Lieut.-Governor of the province, but, though strongly recommended by that gentleman, it was not even entertained by the Committee of Supply. In December of the same year, the York Literary and Philosophical Society also forwarded a petition for the same purpose, which met with a like fate. In 1836, a committee of several gentleman was appointed by the Government to report on a plan for the general survey of the province, which report was presented, but no further action taken in the matter. On motion of the Committee of Supply, it was then resolved that an address should be presented to Sir F. B. Head, the Lieut.-Governor for the time, with reference to the practicability of the desired survey. This, however, failed to go any further, and in December of the same year a Mr. Dunlop gave notice of an address to the King, praying for a grant of wild lands to defray the expenses of a geological survey, which application also met with the same fate as its predecessor, and the matter was thenceforth dropped till the union of the Provinces of Quebec and Ontario and in 1841.

In that year, the Natural History Society of Montreal, through Mr. Benjamin Holmes, and the Literary and Historical Society of Quebec, through Mr. Henry Black, again petitioned for aid to carry out a geological survey. The consideration of these petitions was, therefore, taken up by the Government, and on the motion of the Hon. S. B. Harrison, the sum of £1,500 sterling, for the purposes of such a survey, was included in the estimates. As a result of this action, early in 1842, the advisability of appointing a geologist for the work was considered, and the matter was referred by Sir Charles Bagot, who was the Colonial Governor for the time, to Lord Stanley, then Secretary of State for the Colonies, by whom, on the recommendation of Sedgewick, Murchison, De la Beche and Buckland, the position was offered to Sir William Logan in September of that year.

Logan, who was in England at the time, returned to Canada in the fall and proceeded to Kingston, then the seat of government. Here the question of an assistant was discussed, and, on the recommendation of De la Beche, the services of Mr. A. Murray, a gentleman who had been educated for the navy but who had served for some time on the ordnance survey of Britain, were secured. Murray was already, to some extent, acquainted with Canada, having resided here for several years, and served as a volunteer, also, in the rebellion of 1837. The personal acquaintance of these two men, who have rendered such signal service to this country from a scientific standpoint, began in the winter of 1842–43, and the friendship then established continued unbroken till the death of the former in 1875.

Limited as was the area of Canada fifty years ago, compared with the enormous extent of territory now included under that name, the inception and carrying out of a plan of survey such as Logan contemplated was not a thing to be lightly entered upon or undertaken. Great portions of the country were accessible with difficulty, means of communication were slow and expensive, and the amount of money at his disposal and the staff necessary for the work were lamentably small. With characteristic energy, he addressed himself to the task, and soon formulated a scheme for the carrying on of the explorations required. In the spring of 1843, Logan, who had spent the winter in England, again returned to Canada, reaching Halifax in May, whence he determined to make the journey overland through Nova Scotia, New Brunswick and Quebec, in order to obtain some preliminary ideas as to the structure of that section. It was on this trip that his first work was done in Nova Scotia, and particularly in connection with his famous Joggins section already referred to, of which it has been truly said that "it forms a remarkable monument of his industry and powers of observation." From his previous acquaintance with the rocks and structure of the coal fields of South Wales, Logan was specially fitted to undertake this task, the correct working out of which promised to give him the most satisfactory data for determining the structure and value of the coal fields throughout the rest of that province, as well as of the Carboniferous areas of New Brunswick and eastern Quebec. This great work completed, he spent some time in the examination of the sections

along the south side of the Bay of Chaleur, where, also, thin seams of coal are found, and then proceeded to Gaspé, concerning which reports of the presence of coal had for some years existed, and its determination as a possible coal field was of the very highest importance. Here, in his bark canoe, with a couple of men only, Logan passed some weeks, measuring accurately section after section along the eastern and southern shores of the peninsula, undergoing the usual amount of hardship which such a mode of life entails, and determining very clearly the succession and thickness of the various formations there exposed. The conclusions Logan then arrived at in regard to the value of this so called coal field were to the effect that no deposits of that mineral could ever be found there in workable quantity, and the views then expressed have ever since been accepted as definite, thus preventing the useless expenditure of capital in that direction.

It was fortunate for the early history of this survey that the director should have so thoroughly enjoyed the esteem and confidence, as well as the friendship, of such men as Murchison, Sedgewick and others of the leading geologists of the mother country, by all of whom offers of assistance in all the branches connected with his work were heartily tendered, and without which the elucidation of the particularly knotty problems he every where encountered would have been much more difficult.

While Logan was thus devoting his energies to the working out of the structure of Eastern Quebec, Murray, his assistant, had been equally assiduous in his labors in Western Canada, and in the preface to the Geology of Canada, 1863, Sir William says that "he (Mr. Murray) has blocked out nearly all that is known of the distribution of the rocks in that division of the Province." In addition to his work in this field, Murray also accompanied Logan on his first great exploration of the Gaspé Peninsula in 1845, during which surveys were made of the Shick-shock range and of most of the larger streams that traverse that section. In Western Ontario the examination of the country about the Great Lakes was particularly arduous, but productive of great results, and the surveys then made of many of the hitherto unexplored streams and portions of the coast remain as standard work to the present day,

thus testifying to the accuracy with which these observations were carried on.

The Geological Survey can now be said to have been fairly launched, though under circumstances not the most satisfactory. Uncertainty as to the continuation of the grant caused Sir William much uneasiness, and there was considerable opposition in certain quarters on the ground that the Survey's work was devoid of practical utility. A liberal policy, however, prevailed, and the sum of £2,000 was voted in the session of 1845-6, thus assuring the carrying on of the work for another season at least. Just at this time, however, Sir William received a very handsome offer from the Directors of the East India Company, in which they tendered him the control of the survey of the Indian coal fields; but although the direct remuneration promised was treble that he expected to receive as head of the Survey in Canada, so great was the interest he had already acquired in Canadian geology that he decided to continue in his then position even in the face of such adverse circumstances. At his own expense he had meanwhile hired a house in Montreal which served as museum, office and laboratory, and provided himself with a supply of apparatus and chemicals as well as engaged the assistance of a chemist, the result of all which was that at the end of the second year the Survey was in his debt to the amount of about £800. By the act of the Legislature in the ensuing session the sum of £2,000 was granted for a period of at least five years. The bill upon which this grant was made was designed by Sir William himself, and was to the effect that a certain number of competent persons should be appointed, "whose duty it shall be, under the direction of the Governor in Council, to make an accurate and complete geological survey of the Province, and to furnish a full and scientific description of the rocks, soils and minerals, which shall be accompanied with proper maps, diagrams and drawings, together with a collection of specimens to illustrate the same; which maps, etc., shall be deposited in some suitable place which the Governor in Council shall appoint, and shall serve as a Provincial collection; and that duplicates of the same, after they have served the purposes of the survey shall be deposited in such literary and educational institutions of the eastern and western divisions of the province as by the same authority shall be deemed most advantageous."

The chemist appointed by Sir William, early in the work, was the Count de Rothermund, a student of the École Polytechnique, Paris. His connection with the official staff was, however, but brief. There appeared to be a lack of ability to grapple with the difficulties presented, or a lack of fitness for the position, which resulted in his voluntary retirement in 1846. The vacancy thus caused was speedily filled by the appointment of Dr. T. Sterry Hunt, who at that date was acting as chemist of the Geological Survey of Vermont. This appointment was a particularly happy one, and for nearly twenty-five years in his capacity as chemist and mineralogist, Hunt built up, not only for himself, but for the Canadian Survey a reputation which is world-wide.

With the exception of the department of paleontology, the Survey was then comparatively well equipped and ready to carry on in a satisfactory manner the purposes for which it was established. Although the staff was small, the material was of the best, and exploration went forward at a rapid pace. In 1847, Mr. James Richardson was added, and, in course of over thirty years' work, examined many portions of the Dominion from the Straits of Belle Isle to the distant Island of Vancouver and Queen Charlotte's Sound on the confines of Alaska. Other persons were added from time to time, as the necessities of the Survey demanded or the funds at its disposal permitted. In the branch of paleontology it was, however, found necessary for some years to send abroad for determination many of the valuable specimens, which were rapidly accumulating; and among those who particularly rendered assistance in this way may be mentioned Prof. James Hall, of Albany, N. Y., and Messrs. Salter and Jones, of the English Survey. This difficulty was at length overcome by the appointment, in 1856, of Mr. E. Billings, a former resident of this city, whose love for scientific work in this line was such as to lead him to lay aside his chosen profession of the law, and, at the request of Sir William, to attach himself to his small but zealous band of workers. Of him, also, it may be truly said that much of the great reputation the Survey has acquired, both at home and abroad, is due to his indefatigable labours. The appointment of Mr. Robert Barlow, formerly of the Royal Engineers, as chief draughtsman shortly after, completed the official equipment of the staff

at that time. The work of exploration was, however, carried out in the meantime by the employment of specialists who were selected to carry out special examinations of particular mineral locations, and whose reports were of great value, or by what were considered as permanent employees, who carried forward the work along certain regular lines laid down by the director himself. The attempt to give, even in the briefest form, a synopsis of the work of each of these would cause me to trespass on your time to an unwarrantable extent. The particulars of such work will, however, be found summarized in the preface of that great volume, the "Geology of Canada," 1863, in which the leading features of the operations of the Survey to that date are admirably presented.

Among the important changes in nomenclature which owe their origin to the labours of our Canadian geologists of this period, two, at least, are of special interest. The great series of rocks which had been described by leading geologists for many years under the title of *Primary*, or the *Primitive group*, and, for some years prior to 1854, by Logan himself as the *Metamorphic series*, comprising all those which were held to underlie the lowest fossiliferous zone, were, in the report of that year, styled the *Laurentian*, and at the same time, in regard to the palæozoic formations, the nomenclature of the New York Survey, by which standard these rocks had for many years been classified, was changed to correspond with that employed in the English Survey, and the terms, Lower and Upper Silurian and Devonian came into general use. In the following year, 1855, the great group of rocks which border Lakes Huron and Superior, and which, in the reports of Dr. Bigsby, were styled the *Transition series*, were grouped under the new name *Huronian*. This term was first officially announced in a small volume prepared for the Paris Exhibition of that year and styled "Esquisse Géologique du Canada." The former term, Laurentian, proved so happily chosen that it was subsequently adopted by the English Survey and applied to the great masses of crystalline gneisses and similar rocks which occur on the west coast of Scotland and elsewhere in the British Isles, thus proving in what high estimation the labors of ur own geologists were held by the ablest workers in foreign fields.

While the work of the survey during all these years appeared in a regular series of annual reports, the growing interest taken by the general public in its progress, and the apparent necessity for presenting the conclusions arrived at in a more compact form, at length reached such a point that Sir William Logan, assisted by Dr. Hunt, brought out, in 1863, the volume now known as the "Geology of Canada." In this the investigations and results of the preceding twenty years were admirably summed up, and the latest views of structure of all the formations from the Laurentian to the carboniferous clearly stated, both from the standpoint of the stratigrapher and the paleontologist, while the second part contained an immense amount of the most valuable information relative not only to the chemical composition and origin of the various rocks but to the value and distribution of the most important of our economic minerals.

In connection with this volume, and designed to accompany it, the great geological map of Canada and the adjacent Northern States was published in 1866, of which it may be rightly said that no more beautiful work of the kind has ever been presented by this or any other survey; a work entailing an enormous amount of labour, and reflecting the greatest credit upon all engaged in its compilation, and in the delineation of the exceedingly complicated geological lines there laid down. This great work will always stand as the map *par excellence* and can always be pointed to with a feeling of pride, not only by the members of the survey itself, but by every Canadian who feels an interest in the successful carrying out of the study of geological science in our own country. During all these years of hard work in the field by the officers and staff other matters, involving quite as serious labour, were being presented from time to time. The great exhibitions at London, Paris, and Dublin, to which the survey sent large and characteristic collections, both of rocks and minerals, which set forth in a forcible manner the great wealth of the country in this respect, were productive of much good, but involved an immense expenditure of time and energy. The museum and offices at Montreal were constantly visited by scientific men from all parts of the world, who might be passing through, as well as by others seeking information on various points, and from the old workshop on St. James and St. Gabriel streets

much work of the greatest importance in connection with the development of Canada's mineral resources was produced. The confederation of the provinces in 1867 opened new fields for the Survey's operations, and the hitherto somewhat small amounts, granted from time to time, were soon found to be inadequate to carry on the operations over such greatly extended areas. In the meantime the Survey had lost one of its original members in the person of Mr. Murray, who at the request of the Newfoundland Government had undertaken the survey of that colony, a task for which he was especially fitted by his long acquaintance with the rocks of Ontario and Quebec. The staff had gradually been enlarged, but the great strain to which the director had for some years been subjected now began to tell upon him severely, and in 1869 Sir William Logan felt it incumbent upon him, in view of the greatly increased area to which the operations had been extended, and the growing interest he felt in the elucidation of certain highly puzzling problems of structure in eastern Quebec to which he had for many years devoted special attention, to lay aside, as far as possible, the direct charge of the Survey's operations and to seek a successor. His resignation took effect in that year, and with this date, 1869, we may close the second stage of geological investigation in Canada. The position thus rendered vacant was filled by the appointment of Dr. Selwyn, the present director, a gentleman of very extensive experience, not only in the Official Survey of England and Wales, but in the great colony of Australia, where he had for a long period filled the position, also, of director of the Survey of New South Wales. And from this date we enter upon what we may here style our third period.

Hitherto, as already stated, the work had, for the most part, been confined to the two provinces of Quebec and Ontario, in which the great questions of Canadian geology had been most successfully worked out. Henceforth, it had to include in its scope the distant areas of British Columbia, the great plains of the North-west Territory, the rugged masses of the Rocky Mountains, and the wide expanses of the Peace and Mackenzie River basins, concerning all of which, or in great part, at least, our information was of the most meagre kind, not only of its vastness of territory, but of its geological structure, its mineral wealth, its agricultural capabilities, and its natural history and climatic condi-

tions. It can readily be seen, therefore, that the task now entered upon by Dr. Selwyn was one of no small magnitude. In regard to the North-west and some portion of British Columbia, some work had already been accomplished, both by Prof. Hind, in his exploration of the Saskatchewan plains, and in the great Palliser expedition, by Dr. Hector, and the maps furnished by the latter were for years the only guide by which one could fix his position in that territory with any approach to accuracy. In addition, new and more detailed investigations had, of necessity, to be carried on in the older provinces in connection with the metamorphic and metalliferous rocks, and in the great wilderness country lying between Lakes Huron and Superior and the Hudson and James' Bays, as well as in the eastern provinces of Nova Scotia and New Brunswick. It is, probably, not saying too much, nor, I trust, will it appear to savor of adulation if we state that, probably, no enterprise so great as the complete geological and natural history survey of a country embracing over 3,000,000 square miles was ever undertaken by a staff so small in numbers, or carried on with an expenditure so insignifigant, as is being done by this same Geological Survey of Canada. And it is well within the bounds of truth if we say that to the work of the members of its staff is due, in very large part, much of the information we now possess as to the greatness of the country's resources, both agricultural and mineralogical, between the waters of the Atlantic on the east and the distant boundary of Alaska on the north and west. It will scarcely be necessary to mention individual names in this connection. The various members of the staff and their several fields of labor are too well known to require any special personal reference before an Ottawa audience, and as this paper has already reached an undue length, it will doubtless be found sufficient if we indicate briefly and in general terms the extent of the Survey's operations during the last twenty years and give you some of the results already obtained.

Before doing so, however, it must here be mentioned that much work of the greatest practical value has been carried on in various fields by geologists and others not attached directly to the official staff of the Survey but who have been more or less intimately associated with the carrying out of the work in the several provinces. Of these, the names of several have been already mentioned, while, of others, the results of

their labors have appeared from time to time in some one of the various scientific periodicals either of this country or of England and the United States, the results of which it is, for obvious reasons, impossible to allude to further in the brief limits of a paper such as this.

Briefly summarized, then, the progress of geological investigation during the last twenty years may be thus stated. In the east, the carefully detailed maps of Cape Breton and eastern Nova Scotia have been presented to the public and are worthy of the highest praise. We have also, now, a very good general idea of the structure of the other portions of that province, including the distribution of the great gold-bearing series of the coast rocks from Yarmouth on the west to Guysborough on the east. The structure of the great coal fields of Cape Breton, Pictou and Cumberland have also been carefully studied, and the geological horizons of the ores of iron and manganese, which are of the utmost importance in connection with the future development and progress of the country, have been clearly and satisfactorily determined. In New Brunswick and Prince Edward Island, the geological map of both provinces has been completed, and the exceedingly complex questions in the southern portion of the former, which for many years were wrapped in profound mystery, have been very thoroughly solved. The outlines of the great Carboniferous basin, occupying an area of over 12,000 square miles in this province, have been carefully determined, and its presumptive value from the economic point of view established, while some of the most important work in Canada in connection with the paleontology of the oldest fossiliferous formations has been and is still being carried out with the greatest care.

In Quebec east, the great problem of the age and stratigraphical relations of the Quebec group, a problem which for more than forty years has engaged the attention of geologists, not only in Canada, but, to some extent, in the United States and Europe as well, has, it is hoped, been placed on a comparatively satisfactory basis of settlement, while to the west and north of the St. Lawrence, the mysteries of the great region of the Mistassini have been clearly solved, and great progress has been made in the study of the Laurentian rocks to the north between Quebec and Montreal. The great wilderness country lying between the Ottawa and the James' Bay has been traversed in all direc-

tions along the great natural avenues, by which alone this otherwise pathless area can be explored. Concerning the great extent of country about the Hudson and James' Bays, we have now very clear ideas, not only of the geology, but of its fauna and flora and of its adaptability for settlement, while its topography has also been carefully mapped.

In this country the deposits of iron, gold, phosphate, asbestus and copper have also been investigated, and much valuable information furnished as to their mode of occurrence and value.

In Ontario, while a large amount of exploration has been carried on in the older and more settled portions of the province, relating to the more careful delimitation of the better known formations and to the presence of its economic mineral wealth, much careful work of a very high order has also been done in the areas about Lakes Huron and Superior and further west, where some of the great questions as to the age and origin of the fundamental or lowest rocks of our systems are now in a fair way of being conclusively settled, while the geological relations of the great copper-bearing series, always a question of the greatest importance in the study of this section, have received a large amount of attention. In this connection, the great deposits of Sudbury and vicinity have been, of late, especially prominent.

In Manitoba and the North-west, results of the greatest practical value have followed close upon the investigations of the Survey. Among these may be especially mentioned the discovery of the great coal fields along the eastern slopes of the Rocky Mountains and in the Souris plains, a discovery productive of the greatest interest in connection with the development and future welfare of that vast area, as well as the careful study of its flora and climatic conditions and the fitness of great portions for the successful raising of wheat and the finer grains. To this agency, also, we must refer the greater part of our present knowledge as to the character of the country lying to the north of the North Saskatchewan, the presence and prospective value of petroleum-bearing strata there found, and the existence of great and, till very recently, little known tracts of land also well adapted for settlement and the successful prosecution of the various branches of agriculture, a country as yet accessible with difficulty, but which, before many years, will doubtless be traversed by lines of railway, while on the

waters of the mighty Mackenzie and Peace and their great tributaries, as well as on the great inland seas of that great land, suitable steamboat accommodation will present the necessary means of transport, and carry to the outside world the rich harvests which ere long will be produced from the boundless and fertile plains of that district.

In British Columbia, the work of the last twenty years has made us very familiar with the immense value of the coal fields of Vancouver and with the inexhaustible forests which are found, not only in that island, but at many points on the mainland. The mapping of many of the gold fields of the interior has also been done, and the complicated structure of the great Rocky Mountain chain worked out to a very large extent. The presence of mineral deposits in this region has been established, which may be found before long, upon their development, to equal in value those which have of late years enjoyed a world-wide renown and which occur in the prolongation southward of this same mighty range among the western states and territories. Further to the north, we now know well the value of the coal fields of the Queen Charlotte group, and have a fair idea of the extent and resources of the great territory traversed by the Yukon and other rivers, with many facts relative to the distribution of the gold which is found in that section and of its general geological conditions, further particulars of which you will doubtless be privileged to hear during the present lecture course from some of those who, from an intimate personal acquaintance with this field, are best fitted to discuss the subject fully.

In addition to all this work in the departments of geology and mineralogy, the study of the flora and fauna of the country as a whole, has been carried on at many points, extending from the Atlantic to the Pacific, of all of which our knowledge is great and accurate, while, in the kindred science of palæontology, a reference to the volumes issued during the last fifteen years will serve to show what great strides have also been made in this direction. This is particularly true in connection with the great areas of cretaceous and other closely associated formations which occupy such a wide extent throughout our North-west.

As already stated, the particular history of any one of these fields of investigation would furnish abundant material for a talk of hours instead of minutes. It will, however, I trust, be apparent to all who

have followed this brief sketch that the study of the science of geology in Canada, even though we are a comparatively new country, has not by any means been neglected. Of necessity, in a country so vast, much of the work for years must be largely preliminary, and the conclusions reached be only generalized. The second stage has, however, at many points been reached, when a more careful and detailed study of formations already recognized must be taken up. This will involve the geological relations of our principal minerals and the peculiarities of their modes of occurrence, such as our gold, silver, copper and iron, our asbestus, phosphate, plumbago, manganese, natural gas and petroleum. These are some of the most important economic problems in connection with the science which must now be entered on by the Survey, and the careful consideration and solution of which will, without doubt, constitute factors of the utmost value as concerns the future welfare of our Dominion as a whole.

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GRAY'S MANUAL OF BOTANY.

We are pleased to announce to our botanical members the publication of the new (sixth) edition of Gray's Manual. It has been revised and extended westward to the one hundredth meridian by Dr. Sereno Watson and Prof. J. M. Coulter, with 25 plates illustrating the sedges, grasses, ferns, etc.

This work, which has been anxiously looked for by all working botanists, has only just appeared, too late for review in this number of the NATURALIST, but a notice will appear in the next issue. In the meantime, the editor would remind such of our botanists as may require to get copies that they can do so through Mr. James Hope, who is a member of the Club.

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FIFTH REPORT ON THE INJURIOUS INSECTS OF NEW YORK, BY J. A. LINTNER.

We have to thank Dr. Lintner for a copy of the above valuable contribution to Economic Entomology, which is a report of about 200 pages, illustrated by 50 figures. The chief articles are: Remedies and Preventatives, The Larch Saw-fly, Injurious Lepidotera, The Grain Aphis, and Miscelaneous Observations. It is a mine of useful information, and contains many carefully prepared and choice gems of knowledge. J. F.

MONDAY AFTERNOON POPULAR LECTURES.—HOW TO COLLECT AND PRESERVE BOTANICAL SPECIMENS.

By James M. Macoun.

(Delivered February 3rd, 1890.)

Until a collector has become fairly well acquainted with a collecting ground he should not attempt the collection of both phænogams and cryptogams at the same time. It is much better to make two expeditions to one locality, collecting flowering plants the first day and mosses, lichens, fungi, etc., on the occasion of a second visit. To do good work with cryptogams it seems necessary to focus the eye especially for them and even the most experienced collectors find it impossible to collect them in a satisfactory manner unless they render themselves practically incapable of seeing a flowering plant at all. As most of you however confine your attention to flowering plants, let us imagine that we are about to set out in search of them. It will be necessary to take out with us nothing but a strong knife and a plant press or vasculum. Except where plants are desired for study or are very tender and require peculiar care in drying, I know of no reason why the vasculum should ever be carried by one who is collecting specimens for preservation, although it will always be preferred by some, and much can be said by them in its favour. Apart from the claims that either party may offer, as regards the superior beauty and quality of specimens that have been collected in the one way over those collected in the other, the one argument that to me seems convincing is that if the press be used in the field the specimen is secured beyond a doubt, while this is by no means certain if the vasculum be employed. Assuming that care has been exercised in the arrangement of specimens in the vasculum, and that the collector has reached home with the results of his day's work in good order, there is still the mechanical and less interesting part of the work to be done—the transfer of the specimens to whatever form of press is used—not infrequently one is too tired to do this at night, and it is postponed until the following morning, when too often one is so hurried that the work cannot be done properly, or perhaps not at all, the bare possibility of this happening is sufficient in my opinion to warrant the disuse of the vasculum altogether by collectors of *specimens*

for the herbarium, as without doubt many fine and rare specimens are lost or spoilt simply because they are neglected after they have been collected.

My plan, as soon as the collecting ground has been reached, is to lay the press on the ground or against a stump or tree, and to collect the plants found in the immediate vicinity: when as many as can be conveniently carried in the hand have been gathered, they are taken to the press, the specimens most worthy of preservation are selected and placed between driers, and the others thrown away. It is important that not only the flower, and where possible the fruit, be collected, but the root also. It may be said that large roots often disarrange the press and the specimens it contains, but there is no need of this. I know of no plant, the root of which may not, with a little trouble, be cut down, so that while its structure may be shown, it will not interfere with the proper drying of the other specimens in the same press. The cutting should all be made from one side, and in the case of bulbous and tuberous plants, or those with tap roots, everything beneath the skin should be carefully cut away, and the specimen will for all herbarium purposes answer as well as if the entire bulb, tuber, or root had been preserved. When using a plant press in the field, no care need be exercised in placing specimens between the driers; much time is often wasted in the endeavor to make specimens remain in just the position that seems best to the collector. If they are placed in the press in the most haphazard manner and submitted to moderate pressure it will be found that after a few hours they will become limp—not withered—and may then be arranged to suit any taste; when put under greater pressure the lines where leaves and blossoms have been bent will disappear. After a day's collecting it is by no means necessary that the plants should at once be transferred to the home press, although the sooner this is done the better, for it should not be forgotten that as soon as driers become saturated, their usefulness is gone. At home a screw or lever press may be used, but a piece of broad board and two or three stones of various weights will answer much better. It is a mistake to use too great pressure, all that is required, is that all parts of the specimen come in contact with the driers, and that the weight be sufficient to prevent wrinkling. What the weight should be depends upon the number

of sheets under pressure. The driers between which specimens have been placed should be changed at least twice a day, until the plants are almost dry, and care should be taken that the papers used for driers should be quite free from moisture; this is best effected by spreading them out where the sun's rays will fall directly upon them, or by placing them in an oven or upon a stove. If specimens are to be dried quickly, two sets of driers should be used and changed every half hour, the driers not in use having in the meantime been thoroughly dried and heated; or the specimens may be placed between thick sheets of blotting paper and dried in a few minutes by means of a hot flat-iron; or after the specimens have been in the press for one day they may be placed between two driers and exposed to the sun. Some species lose their original colour if dried in any of these ways, but their number is small and experience soon teaches one what they are; they are however apt to become brittle, but this difficulty may be obviated with a little care. The specimens should not be made quite dry, but only almost so, and then placed under light pressure for a few hours. Many plants such as the Sedums or Stonecrops, the Cacti, nearly all Orchids and some others are difficult to dry if ordinary methods be employed; they may, however, be made ready for the herbarium in a few hours by simply dipping them in boiling water a sufficient number of times to quite kill them; there is nothing then to be done but to press out the moisture they contain. By this means all plants of a succulent nature are most easily dried.

Potamogetons and kindred water-plants should be placed between masses of paper as soon as taken from the water, and while still wet pressed a little and then transferred to the ordinary driers which need not again be changed.

Vascular Cryptogams such as ferns, equisetums, and club-mosses are collected with flowering plants, as they are of about the same size and dried in much the same manner.

In collecting mosses, lichens, fungi and liver-worts, the vasculum, a basket or even a canvas bag, or large handkerchief may be used; with the exception of fungi all are best when collected shortly after rain has fallen, and are then, too, procured most easily. With the exception of fungi the method of drying all is the same, and is very

simple. Secure fruiting specimens when possible, and after cutting off as much bark, dirt, or rotten wood as is advisable from them, place them between driers, press them slightly and then expose them to the sun until nearly dry, or leave them in a loosely fastened press placed in a small room. Fungi are difficult to dry properly, they should as a general rule be placed gills upward in the sun and will dry in that way in a day or two, but many of them cannot be treated in this way, nor indeed preserved at all.

With all forms of plants the collector should select the best specimens that are to be had when a plant is first seen, and if better are found later on, one should not hesitate to replace, with them, those already collected. While the selection of good specimens in the field is the first important point, care in preserving and drying them is what makes good herbarium specimens. The work in the field may be the most interesting, but it amounts to little more than a health-giving pastime unless the results of the work be preserved in a proper manner.

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LIST OF MOSSES COLLECTED IN THE NEIGHBORHOOD OF OTTAWA.

By John Macoun, M.A., F.R.S.C., F.L.S.

(Continued from Vol. II, page 272.)

Since the publication of the list of mosses in Vol. II of the Transactions of the Ottawa Field-Naturalists' Club, I have collected the following species:

124. Sphagnum rubellum, Wils.—Mer Bleue (Oct., 1889).

125. Sphagnum cuspidatum, Ehrh.—Mer Bleue (Oct., 1889.)

126. Sphagnum intermedium, Hoffm.—In wet woods north of Beechwood, Ottawa (Oct., 1889).

127. Sphagnum squarrosum, Pers.—Quite common in little ponds and wet spots north of Beechwood, Ottawa (Oct., 1889).

128. Ephemerum serratum, Hampe, *var.* angustifolium, Schimp. —Not uncommon on overflowed ground at Hull Cemetery and Leamy's Lake (Oct., 1889).

129. Archidium Ohioense, Schimp.—With the preceding (Oct., 1889).—New to Canada.

130 Weisia viridula, Brid.—On earth on hummocks north of Leamy's Lake near Hull (Oct., 1889).

131. Dicranum scoparium *var.* scoparioime, Kindb.—On roots of trees and logs in McKay's woods and Dow's swamp (Aug., 1889).

132. Dicranum palustre, La Pyl.—On earth in Dow's swamp (Sep., 1889.)

133. Fissidens tamarindifolius, Brid.—On earth on hummocks and at the base of trees north of Leamy's Lake (Oct., 1889). New to America.

134. Fissidens pusillus, Wils.—Very common on flat limestone rocks in McKay's woods; fruiting abundantly (Oct., 1889).—New to America.

135. Fissidens decipiens, De Not.—Very common on old stumps and logs in Dow's swamp, and on stones and stumps in McKay's woods (Sep., 1889).

136. Leptotrichum glaucescens, Hampe.—On earth close to Hull Cemetery, Leamy's Lake (Oct., 1889).

137. Orthotrichum speciosum, Nees.—On trees in all woods around Ottawa (Aug., 1889).

138. Orthotrichum connectens, Kindb. (N. sp.)—Habit of *Ulota crispa*. Monœcious. Tufts dense, green above, very radiculose below. Stem 2-12 mm. high. Leaves very *crispate* when dry, revolute nearly all around, papillose, obtuse or obtusate, long-lanceolate, at the base a little broader; the upper cells round, only the basal narrow, the marginal ones not distinct; costa disappearing above, not percurrent. Capsule (not ripe) exserted; calyptra cylindric—narrow, very hairy.—On cedar trees near the pond in Dow's swamp (Sep. 11, 1889).

139. Encalypta streptocarpa, Hedw.—Crevices of rocks at the outlet of Leamy's Lake near Hull Cemetery (Aug., 1889).

140. Physcomitrium immersum, Sulliv.—On earth on clay banks forming the outlet of Leamy's Lake; very rare (Sep., 1889).—New to Canada.

141. Webera nutans, Hedw.—On moist ground and rotten wood in Dow's swamp, and in woods at Leamy's Lake (Aug., 1889).

142. Webera cruda, Schimp.—Crevices of rocks at the outlet of Leamy's Lake (Aug., 1889).

143. Bryum capillare, Linn.—In abundance on rocks, Gilmour's Park, Chelsea, Que. (Sep., 1889).

50. Bryum Ontariense, Kind. N. sp.—This is the *B. roseum* of first article; fruiting abundantly this year (Aug., 1889).

144. Mnium affine *var.* rugicum, Bruch. & Schimp.—On wet, boggy ground near the pond in Dow's swamp (Sep., 1889).—New to Canada.

145. Mnium inclinatum, Lindb.—Crevices of limestone rocks at McKay's Lake, and outlet of Leamy's Lake (Aug., 1889).—New to America.

146. Mnium orthorrhynchum, Bruch. & Schimp. — Crevices of rocks along McKay's Lake, Beechwood (Oct., 1889).

147. Polytrichum commune, Linn.—Common on earth in the wet woods north and west of Beechwood (Aug., 1889).

148. Myurella julacea, Bruch. & Schimp. On the base of rotten stumps in Dow's swamp.—Rare.—(Sep., 1889.)

149. Leskea polycarpa, Ehrh.—Very abundant on trees subject to inundation in the woods at Leamy's Lake (Aug., 1889).

150. Leskea nigrescens, Kindb. N. sp.—On stones in McKay's woods (Oct., 1889).

151. Pylaisia Selwynii, Kindb. N. sp.—On old rails along the Richmond road (Aug., 1884).—Mixed with *P. intricata.*

152. Hypnum (Brachythecium) acuminatum, Beauv.—Common on earth and at base of trees in Beechwood and at Carleton Place (Sep., 1889).

153. Hypnum (Brachythecium) acutum, Mitt.—On stones in McKay's woods, and at Carleton Place (Sep., 1889).

154. Hypnum (Brachythecium) Donnellii (?) Austin.—On roots of trees in woods at Carleton Place (Sep., 1889).—New to Canada.

155. Hypnum (Brachythecium) Novae-Angliae, Sulliv. & Lesq. —On earth in McKay's woods (Aug., 1889).

156. Hypnum (Brachythecium) populeum, Hedw.—On rocks in Gilmour's Park, Chelsea, and at Carleton Place (Sep., 1889).

157. Hypnum (Eurhynchium) substrigosum, Kindb. N. sp.—Differing from *H. strigosum* in the leaves, being twice greater, subdistichous,

long—decurrent; branches complanate, the immature capsule very much constricted under the orifice; cilia appendiculate: inflorescense monœcious.—On old logs by pools of water in woods north of Beechwood (Oct. 12, 1889).

158. Hypnum (Rhynchostegium) serrulatum, Hedw.—On the ground in McKay's woods and at Carleton Place (Sep., 1889).

159. Hypnum (Plagiothecium) Passaicense, Lesq. & James.—Abundant on the base of cedar trees and stumps in Dow's swamp (Sep. 11, 1889).

160. Hypnum (Amblystegium) varium, Beauv.—On earth, decayed wood and stones in McKay's woods, and at Carleton Place (Sep., 1889).

161. Hypnum (Amblystegium) porphyrhizon, Lindb.—On stones and earth in wet woods at Ottawa and Carleton Place (Sep., 1889).

162. Hyynum (Amblystegium) Zuratski.—On stones and earth in woods at Carleton Place (Sep., 1889).

163. Hypnum (Amblystegium) fluviatile, Swartz.—On stones in the brook that discharges from Kingsmere near Chelsea, and in a brook at Carleton Place (Sep., 1889).

164. Hypnum (Amblystegium) subtile, Hoffm.—Abundant on the trunks in woods at McKay's Lake (Oct., 1889).

165. Hypnum (Campylium) Sommerfeltii, Myrin.—On the ground at the roots of trees at Rockcliffe (Aug., 1869).

166. Hypnum (Harpidium) fluitans, Linn.—In the marsh at McKay's Lake, and rear of Beechwood (Oct., 1889).

167. Hypnum (Harpidium) aduncum, *var.* platyphyllum (N. var.), Kinb.—On stones in damp woods at Rockcliffe (Aug., 1889).

168.—Hypnum (Ctenidium) *molluscum*, Hedw.—*On old logs in* Dow's swamp and rear of Beechwood (Sep., 1889).

169. Hypnum subimponens, Lesq. (?)—On logs in woods at Carleton Place (Sep., 1889).

170. Hypnum curvifolium, Hedw.—In wet woods in rear of Beechwood Cemetery (Oct., 1889).

171. Hypnum (Calliergon) giganteum, Schimp.—In wet, springy places, Dow's swamp (Sep., 1889).

172. Hypnum (Calliergon) Richardsoni, Lesq. & James.—In the marsh at the head of McKay's Lake (Oct., 1889).

173. Hypnum (Calliergon) Schreberi, Willd.—Quite common under pine trees in McKay's woods, and in Gilmour's Park, Chelsea (1889).

CANADIAN GEMS.

A neat little pamphlet entitled "A Catalogue of Mineralogical Gems," printed by the *Citizen Co.*, has just been laid upon our table, and is issued by the new firm of C. P. Willimott & Co., of this city. From this pamphlet we learn that we have in our midst facilities, not before enjoyed, both for the cutting and polishing of gems not only from Canadian sources but from all parts of the world. There has long been an idea amongst most people that our Canadian minerals did not furnish material suitable for the purpose, but a glance at the list shows us that amongst our native gems we have many kinds which, when properly cut, furnish stones of great beauty and value.

In addition, this firm also undertakes the preparation of rock sections for microscopical examination, thus doing away with the necessity which has heretofore existed of sending abroad to Germany or the United States for this kind of work.

Characteristic collections of Canadian minerals will also be made and kept in stock, both suitable for private parties and for scientific educational institutions. These will be of great value, not only to the private collector and those engaged in prospecting, but to all interested in or devoted to the work of teaching mineralogy. These collections are of different sizes and prices, ranging from $1 each upwards, the price depending on the number and value of the specimens contained.

A visit to their workshop on Wellington street, where a large collection of cut gems is kept in stock ready for mounting, will amply repay anyone who may desire anything in this line, while the various polished slabs of Agate, Labradorite, etc., together with the display of neatly arranged collections and unique crystals, will be of great interest to most persons.

We congratulate this young firm upon the amount of push and energy requisite to the establishment of such an enterprise, and from our personal knowledge of the members of the firm, we not only wish them every success, but feel that they will give every satisfaction to any of our readers who may require anything in their line.

J. F.

A RARE BUTTERFLY (*Erebia discoidalis*, Kirby).

Two beautiful specimens of this butterfly, one of the rarest in the Canadian fauna, have been received from Mr. John D. Evans, who collected them at Sudbury, on the Canadian Pacific Railway, on 12th May last.

The species was described by Kirby (Fauna Boreali-Americana, IV, p. 298, pl. 3, figs. 2, 3, 1837) from Cumberland House, lat. 54°. In 1863, several examples were taken at Fort Simpson, Mackenzie River, by Mrs. Christina Ross, and sent to Mr. W. H. Edwards, together with the types of *Colias Christina*, which latter was named after the collector. Specimens were also sent from Hudson Bay to Mr. Hermann Strecker. In 1889, one specimen was again sent out from Fort Simpson, which had been taken by Mr. Frederick Bell, in the end of June, 1888. Last summer, specimens were collected near Fort Qu'Appelle, N. W. T., by Mrs. Cora E. Rose (Can. Ent. XXI, p. 238). The most interesting locality of all, however, is that now discovered by Mr. Evans, in Ontario, at Sudbury. He took five specimens in a short time upon the same day, which would indicate that they were in some abundance. Nothing is known of the preparatory stages, but now, on account of the comparative accessibility of Sudbury, and the readiness with which the butterflies of grass-feeding caterpillars deposit their eggs, there is every chance that the life-history of this rare insect will be worked out. The perfect insect is figured and described by Mr. W. H. Edwards in his Butterflies of North America, Series III, pt. vii.

J. F.

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PUBLICATIONS RECEIVED.

The following publications have been received during the year, by gift or in exchange, for which the thanks of the Council are tendered to the donors, who are respectfully requested to accept this in lieu of other acknowledgment.

PERIODICALS.

Auk, The: (Organ of the American Ornithologists' Union).
Botanical Gazette.
Bulletin of the Torrey Botanical Club.
Boston Society of Natural History—Proceedings.
Canadian Entomologist.
Canadian Record of Science.
Cincinnati Society of Natural History—Journal.
Cornell University, Agricultural Experiment Station—Bulletin.
Conchologist's Exchange.
Entomologica Americana.
Essex Naturalist.
Geological Survey of Canada—Report, 1887-8.
Insect Life. From U. S. Dep. of Agriculture.
Johns Hopkins University—Circulars.
Journal of Mycology. From U. Dep. of Agriculture.
Journal of Comparative Medicine and Surgery.
Kansas Academy of Sciences—Transactions, 1887-8.
K. Svenska Vetenkaps—Akademiens—Bihang 3 and 4.
Manitoba Historical and Scientific Society—Transactions.
Nautilus: (Conchological).
Naturwissenschaftliche Wochenschrift.
Natural History Society of New Brunswick—Bulletin.
Natural Science Association of Staten Island—Proceedings.
Nova Scotian Institute of Natural Science—Proceedings.
New York Microscopical Society—Journal.
New York State Entomologist—Fifth Report.
Ornithologist and Oölogist.
Ormerod, Miss E. A.—Report on Injurious Insects, 1888.
Ohio Agricultural Experimental Station—Bulletins.
Ontario Fruit Growers' Association—Report, 1888.

Psyche: (Entomological).

Université Laval—Annuaire, 1889–90.

United States Geological Survey—Monographs XIII and XIV—Bulletins 48 to 53.

Weather Review (Meteorological Service of Canada), and Report, 1886.

Wisconsin Academy of Sciences—Transactions, 1883–7.

OTHER PUBLICATIONS.

American Ornithologists' Union—Supplement to Check List of N. A. Birds.

Fletcher, James—A Trip to Nepigon: (Entomological).

Honeyman, Rev. D.—(1) Nova Scotian *Echinodermata*. (2) Two Cable Hauls of Marine Invertebrates.

Miller, S. A.—North American Geology and Palæontology.

Ormerod, Miss E. A.—Notes of Injurious Insects of South Africa.

Smith, John B.—(1) *Noctuidæ* of Temperate North America. (2) Revision of Species of *Oncocnemis* (three papers). (3) Preliminary Catalogue of *Arctiidæ* of Temperate North America. (4) Report of Meeting of Association of Economic Entomologists.

Smithsonian Institution—Reports of Secretary, 1866 to 1872, and 1874 to 1876.

United States Department of Agriculture—The Root-knot Disease.

Vasey, Dr. G.—Agricultural Grasses of the United States.

Whiteaves, J. F.—Contributions to Canadian Palæontology, Vol. I, Pt. II (2, 3 and 4).

Williams, H. S.—(1) Fossil Faunas of the Upper Devonian. (2) New Crinoids from Rocks of the Chemung Period (N.Y.) (3) On a Crinoid with Moveable Spines. (4) On the Different Types of the Devonian System in North America. (5) Comparison of the Muscles of Chelonian and Human Shoulder-girdles. (6) Undulations of Rock Masses across Central New York. (7) *Lamellibranchiata* and Species-making. (8) On the Classification of the Upper Devonian. (9) The Ideal Modern Scholarship. (10) Methods of Instruction in General Geology. (11) Geographical and Physical Conditions, as Modifying Fossil Faunas. (12) Fossils of the Upper Devonian (Genesee Section). (13) Synopsis of a Course of Lectures on the Elements of Historical Palæontology. (14) Report of the Sub-Committee on the Upper Palæozoic. (15) Channel Fillings in the Upper Devonian Shales. (16) On the Occurrence of *Proëtus longicaudus*.

BOOK NOTICE.

PROCEEDINGS OF THE ORNITHOLOGICAL SUB-SECTION OF THE BIOLOGICAL SECTION OF THE CANADIAN INSTITUTE FOR THE YEAR 1889.

This interesting pamphlet, published under the editorship of Mr. Ernest E. Thompson, is extracted from the Proceedings of the Canadian Institute, of Toronto. It will well repay a careful perusal by any student of birds, containing, as it does, a large number of notes of the arrival and departure, and of the breeding, feeding and other habits of birds, the majority of which are to be found here as well as there. Besides this, there are many notes of the occurrence of rare birds, and of birds not found in this locality, but which, perhaps, in consequence of an extension of *habitat*, may be found here at some time in the near future. Among these last, the Yellow-billed Cuckoo (*Coccyzus americanus*) is now found to be "a regular, though far from common, summer resident" at Toronto, whereas it was formerly considered but an accidental straggler. The capture of the Razor-billed Auk (*Alca torda*), on Toronto Bay, on December 10, proves that the ornithological field can never, with safety, be said to be completely worked out in any given locality. The wintering of the American Goldfinch (*Spinus tristis*) and the Crow (*Corvus americanus*) in 1888–89 are interesting as corresponding with our experience here. One pair of the latter species, at least, has spent the winter here, regularly, for several years, feeding at a slaughter-house not far from the city limits. The taking, at Toronto, of several species of hawks, with their stomachs full of grasshoppers, will add further weight to the impression, which, fortunately, is gaining ground steadily, that these birds are the friends, and not the enemies of the farmer. We earnestly commend the pamphlet to the attention of our ornithological readers. W. A. D. L.

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ERRATA.—In the list of new members in the last number of the NATURALIST, p. 116, for "J. Rainson Wills" read "J. Lainson Wills, M.E., F.C.S.

In the instalment of "Flora Ottawaensis" issued with same number, the pages should be numbered from 62 to 69 instead of from 121 to 128.

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NEW MEMBERS.—John Law; Willibert Simpson; Miss Steacy.

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This number is issued March 14th, 1890.

INDEX.

1878. P. LAPATHIFOLIUM, L. (Dock leaved Persicaria.)

P. nodosum, Pers. Macoun, Cat. III, 409.

Low ground. Aug.—1. Sheaths and bracts not ciliate. Spikes short, erect or nearly so. Peduncles with scattered sessile glands.

1879. ———————— var. INCARNATUM, Watson.

P. incarnatum, Ell. Macoun, Cat. III, 409.

Low, rich ground. Not uncommon. Aug.—1. A tall, coarse plant sometimes four feet high, with long leaves and nodding, slender, spikes of pale pink flowers.

1880. P. PENNSYLVANICUM, L.

Low, rich ground. Common. Aug.—1. (B) A tall handsome species with conspicuous flowers. Easily recognisable by the stalked glands on the peduncles.

1881. P. AMPHIBIUM, L. (Water Persicaria.)

In shallow water. Common Aug.—1. (B) Flower spike erect, terminal, borne above the water from the centre of two or three floating leaves.

1884. P. HARTWRIGHTII, Gr.

P. amphibium, L. var *terrestre*, Auct.

In ditches and at the sides of streams and ponds. Not uncommon. Aug.—1. This species has been, until lately, confounded with *P. amphibium* and *P. Muhlenbergii*, Watson. It differs from the former in its habit of growth and the nature of the inflorescence. In this species and *P. Muhlenbergii* the flowers are borne in a slender elongated spike. *P. Hartwrightii* has foliaceous and ciliate sheaths. These characters are lacking in *P. Muhlenbergii*, which, however, is rough, with appressed hairs all over.

1885. *P. Persicaria*, L. (Lady's Thumb.)

In cultivated and waste ground. Common. July—2. (B) Leaves usually blotched, sheaths fringed, peduncles without glands, spikes short and thick.

1886. *P. Hydropiper*, L. (Common Smartweed.)

Low ground. Annual. Aug.—2. (B) Whole plant smooth. Flowers greenish, tipped with pink, spikes nodding.

1887. P. ACRE, H B K. (Water Smartweed.)

Low ground. Rare. Billings Bridge. Aug.—1. Perennial.

Spike slender, erect, terminal. Flowers whitish. Sheaths covered with rusty hairs. The sepals of this and the last species are dotted with conspicuous glands.

1888. P. HYDROPIPEROIDES, Mx. (Mild Water-Pepper.)

In water and wet places along streams. Billings Bridge. Casselman. Hull. Aug.—1. Perennial. Stem smooth, weak, branching. Sheaths hairy. Flowers white in erect spikes. Sepals not dotted.

1890. *P. orientale*, L. (Prince's Feather.)

A garden escape. A tall, handsome annual with dense cylindrical spikes of large rose-coloured flowers. Billings Bridge. Aug.—2.

1895. P. ARIFOLIUM, L. (Halberd-leaved Tear-thumb.)

Swamps. Lake Flora. Mer Bleue. July—2. (B) Leaves large, long-petioled. Peduncles glandular, bristly.

1896. P. SAGITTATUM, L. (Arrow-leaved Tear-thumb.)

Low ground and along streams. Much commoner than the last. July—2. (B) Leaves short-petioled. Peduncles smooth.

Both of these last-named plants are annuals, with weak stems, beset on the angles with sharp, reflexed prickles, by means of which they support themselves amongst the low herbage where they grow.

1897. *P. Convolvulus*, L. (Black Bind-weed. Wild Buckwheat.)

An introduced and troublesome weed throughout the Dominion. June—4. Seeds black, dull.

1898. P. CILINODE, Mx. (Hairy-jointed Bind-weed.)

Sandy and clayey banks. Not uncommon. Aug.—1. (B) A rather attactive plant, with deeply-veined leaves. Stems red, climbing. Flowers white, in panicled racemes. Seeds smooth and shining.

1899. P. DUMETORUM, L. var. SCANDENS, Gray. (Climbing False Buckwheat.)

Climbing over bushes. Township of March *(A. H. Moore)*. Chats Rapids. Rare. Aug.—1. Seed smooth and shining.

FAGOPYRUM, Tourn. Buckwheat.

1900. *F. Tartaricum*, L. (Rough Buckwheat.)

An accidental introduction. Billings Bridge. Stewarton. July

—3. This plant differs from *F. esculentum* in having smaller greenish flowers and a wrinkled seed.

1901. *F. esculentum*, Mœnch. (Common Buckwheat.)

Introduced. Common. Aug.—1.

RUMEX, L. Dock.

1904. R. OCCIDENTALIS, Watson.

Swamps. St. Louis Dam. Lake Flora. Hull. July—1. A tall species. Valves of the seed rounded, heart-shaped, without exterior grain like tubercles.

1906. R. BRITANNICA, L. (Great Water-Dock.)

R. orbiculatus, Gray.

Swamps and beside streams. Malloch's Bay. Hull. Mer Bleue. Aug.—2. Tall and stout, with a contracted panicle. Seed-valves round-ovate, all grain-bearing.

1907. R. SALICIFOLIUS, Weinmann. (White Dock.)

Introduced here from the west. Waste lot on Albert street. Several plants. July—2. This dwarf species is easily recognised by its pale, almost glaucous, narrow leaves and copious yellowish fruit. Seed-valves deltoid-ovate, with one, two, or sometimes all three, bearing a large grair

1908. R. VERTICILLATUS, L. (Swamp Dock.)

River sides and ditches. Rather uncommon. Billings Bridge. Skead's Mill. Hull. Templeton. June.—3. (B) The lower whorls of flowers distant. Fruit-bearing pedicels elongated, three to four times longer than the calyx, abruptly reflexed. Seed valves each bearing a large grain.

1909. *R. crispus*, L. (Curled Dock.)

Introduced. Common by roadsides and in cultivated ground. June—3. (B) Easily recognised by the waved margin of the leaves. Seed-valves round-heart-shaped, mostly grain-bearing. Much used as a pot herb.

1910. *R. obtusifolius*, L. (Bitter Dock. Dairymaids' Dock.)

Introduced. Much rarer than the last. Rifle Range. Billings Bridge. Gatineau Point. July—2. Seed-valves ovate-halberd-shaped, with three to five large lateral teeth towards the base. This is the best dock for removing the pain of nettle stings.

1912. R. MARITIMUS, L. (Golden Dock.)

River bank. Rare. Green's Creek *(A. H. Moore)*. New Edinburgh *(H. M. Ami)*. Hull *(Prof. Macoun)*. Aug.—2. A low plant, with crowded, leafy, compact spikes of yellow fruit. Seed-valves spear-shaped, with two long teeth on each side and a large grain on the back.

1913. *R. Acetosa*, L. (Common Sorrel.)

Occasionally introduced with grass seed; but not persistent. Billings Bridge. Hintonburgh. July—2. Dicœcious. Seed-valves grain-bearing, enlarging as the fruit ripens.

1915. R. ACETOSELLA, L. (Sheep Sorrel.)

Abundant in sandy soil and exhausted fields. July—1. Dicœcious. Seed-valves ovate, scarcely enlarging in fruit, not grain-bearing.

ARISTOLOCHIACEÆ.

ASARUM, L. Asarabacca.

1916. A. CANADENSE, L. (Wild Ginger.)

Rich woods. Common. May—4. (B) A charming plant, with its rich purplish brown, three-cleft flower, borne low on the ground beneath the leaves, in the axil of the two delicate green, pubescent, kidney-shaped leaves. The fleshy root is aromatic, when broken smelling like ginger.

PIPERACEÆ.—Pepper Family.

SAURURUS, L. Lizard's Tail.

1918. S. CERNUUS, L.

In shallow water. In great abundance along the Nation River at Casselman. July—3. This is the only station so far recorded in this part of Canada.

THYMELEACEÆ. Mezereon Family.

DAPHNE, L.

1921. *D. Mezereum*, L. (Mezereon.)

Rocky woods. Near Hemlock Lake, Beechwood. (Mrs. Charlin.) Ap.—4. Introduced, but well established. The beautiful pink or white fragrant flowers opening before the leaves. Followed by scarlet berries.

SUMMARY

—OF—

Canadian Mining Regulations.

NOTICE.

THE following is a summary of the Regulations with respect to the manner of recording claims for *Mineral Lands*, other than Coal Lands, and the conditions governing the purchase of the same.

Any person may explore vacant Dominion Lands not appropriated or reserved by Government for other purposes, and may search therein, either by surface or subterranean prospecting, for mineral deposits, with a view to obtaining a mining location for the same, but no mining location shall be granted until actual discovery has been made of the vein, lode or deposit of mineral or metal within the limits of the location of claim.

A location for mining, except for *Iron* or *Petroleum*, shall not be more than 1500 feet in length, nor more than 600 feet in breadth. A location for mining *Iron* or *Petroleum* shall not exceed 160 acres in area.

On discovering a mineral deposit any person may obtain a mining location, upon marking out his location on the ground, in accordance with the regulations in that behalf, and filing with the Agent of Dominion Lands for the district, within sixty days from discovery, an affidavit in form prescribed by Mining Regulations, and paying at the same time an office fee of five dollars, which will entitle the person so recording his claim to enter into possession of the location applied for.

At any time before the expiration of five years from the date of recording his claim, the claimant may, upon filing proof with the Local Agent that he has expended $500.00 in actual mining operations on the claim, by paying to the Local Agent therefor $5 per acre cash and a further sum of $50 to cover the cost of survey, obtain a patent for said claim as provided in the said Mining Regulations.

Copies of the Regulations may be obtained upon application to the Department of the Interior.

A. M. BURGESS,
Deputy of the Minister of the Interior.

DEPARTMENT OF THE INTERIOR,
Ottawa, Canada, December 19th, 1887.

Statutes of Canada

—AND—

OFFICIAL PUBLICATIONS.

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The Statutes and some of the Publications of the Government of Canada, are for sale at this office. Also separate Acts. Revised Statutes: price for 2 Vols. $5.00, and for supplementary volume $2.50. Price List sent on application.

B. CHAMBERLIN,
Queen's Printer and Controller of Stationery.

Department of Public Printing and Stationery.
Ottawa, February, 1889.