1885. 1886.

OTTAWA

FIELD-NATURALISTS'

CLUB

Transactions No. 7

VOLUME II. No. III.

OTTAWA, CANADA:
Citizen Printing and Publishing Company, Metcalfe St.
1887.

1885. 1886.

OTTAWA

FIELD-NATURALISTS' CLUB.

TRANSACTIONS NO. 7.

VOL. II. NO. III.

CONTENTS.

OTTAWA, CANADA:

CITIZEN PRINTING AND PUBLISHING COMPANY, 31 METCALFE STREET.

1887

Patron:

HIS EXCELLENCY THE MARQUIS OF LANSDOWNE,
GOVERNOR GENERAL OF CANADA.

President:

W. H. HARRINGTON.

Vice-Presidents:

1ST, PROF. J. MACOUN, | 2ND, S. WOODS.

Secretary:

JAMES FLETCHER.

Treasurer:

T. J. MACLAUGHLIN.

Librarian:

W. L. SCOTT.

Committee:

F. D. ADAMS, | H. M. AMI, | REV. C. F. MARSAN.

Standing Committees of Council:

Publishing—JAMES FLETCHER, W. L. SCOTT, F. D. ADAMS.

Excursions—T. J. MACLAUGHLIN, REV. C. F. MARSAN, H. M. AMI.

Soirees—JAMES FLETCHER, PROF. J. MACOUN, S. WOODS.

Corresponding Members:

SAUNDERS, WM., *F.R.S.C.*, London, President of Entomological Society of Ontario.

HILL, A. J., *C.E.*, Port Moodie, B.C.

EDWARDS, HENRY, 185 East 116th Street, New York, U.S.

ANDERSON, REV. DUNCAN, *M.A.*, Spruce Cliff, Levis, Que.

SMITH, JOHN B., National Museum, Washington, U.S.

MERRIAM, DR. C. HART, Locust Grove, N.Y., U.S.

PROVANCHER, ABBÉ, Cap Rouge, Que.

LIST OF MEMBERS.

Adams, F. D., *B.A.Sc.*
Allan, W. A.
Ami, H. M., *M.A.*, *F.G.S.*
Anderson, W. P., *C.E.*
Anderson, Mrs. W. P.
Armstrong, John R.
Armstrong, *Rev.* Wm. *M.A.*,
Ashworth, John.
Balland, *Rev.* J.B., *O.M.I.*, *D.D.*
Ballantyne, J.
Baptie, Geo., *M.A.*, *M.D.*
Barlow, A. E.
Bate, C. Percy.
Bate, H. Gerald.
Bate, H. N.
Bel, E. B.
Bennetts, F. K.
Billings, B. B.
Billings, W. R.
Boardman, Wm. F.
Boulton, J. G., *Staff-Com. R.N.*
Bourinot, J. G., *F.R.S.C.*
Bowman, Amos.
Bristow, A. A.
Bristow, Mrs. A. A.
Broadbent, Ralph L.
Brodie, W. (Toronto.)
Brough, James S.
Brumell, H. Pareth.
Bucke, Horace W. (London.)
Burgess, T. J. W., *M.D.*, *F.R.S.C.* (London, Ont)
Butterworth, C. A.
Campbell, A. M., *M.A.* (Perth.)
Campbell, Wm.
Casey, Maurice W.
Chalmers, Robert.
Chamberlin, Mrs. B.
Chisholm, A.
Christie, A. J., *Q.C.*
Chrysler, F. H., *B.A.*
Cousens, W. C., *M.D.*
Craig, Wm. (Russell.)
Creighton, J. G., *B.A.*, *B.C.L.*
Davy, R. A., *C.E.*
Dawson, G.M., *D.S.*, *Assoc.R.S.M.*, *F.G.S.*, *F.R.S.C.*
Devlin, R. J.
Dimock, W. D., *B.A.*
Dixon, F. A.
Dodd, R.
Donaldson, B.
Ewart, D.
Faribault, E. R.
Ferrier, W. F.
Fleming, Sanford, *C.E.*, *C.M.G.*, *F.R.S.C.*
Fletcher, James, *F.L.S.*, *F.R.S.C.*
Fletcher, Mrs. J.
Fortescue, L.
Fortescue, Mrs. L.
Fuller, Thos., *R.C.A.*
Garvock, W. B.
Gemmill, J. A.
Giroux, N. J.
Grant, Miss Isabel L.
Grant, J. A., *M.D.*, *F.R.C.S.*, *F.G.S.*, *F.R.S.C.*
Grant, Miss Jessie.
Grant, Miss Mary.
Griffin, W. H.
Hale, J.
Hardie, John.
Harmon, Miss A. Maria.
Harrington, W. H.
Harrington, Mrs. W. H.
Harrison, Edward.
Hayter, F., *B.A.*
Herridge, *Rev.* W. T., *M.A.*
Hodgins, John.
Ingall, E. D.
Johnson, Geo.
Johnson, E. V., *C.E.*
Jones, C. J.

Kearns, J. C.
Keefer, Thos. C., *C.E.*
Keeley, D. H.
Kilgannon, A. P., *C.E.*
Lambart, *Hon.* O.H.
Lambe, L.M.
Lampman, A., *B.A.*
Lampey, Wm. G.
Latchford, F. R., *B.A.*
Lawson, *Prof.* G., *Ph. D.*, *LL.D.*, *F.C.I.*, *F.R.S.C.* (Halifax.)
LeSueur, W. D., *B.A.*
LeSueur, Mrs. W. D.
Lett, W. P.
Lindsay, A.
Loux, Wm., *M.D.* (Russell.)
Lowe, John.
MacCraken, John I.
McConnell, R. G., *B.A.Sc.*
McGill, A., *B.A.Sc.*
MacLaughlin, T. J.
McElhinney, M. P.
McInnes, Wm.
McLaughlin, S.
McLean, J. D.
McMillan, John, *M.A.*
McNab, Chas.
Macoun, John, *M.A.*, *F.L.S.*, *F.R.S.C.*
Macoun, J. M.
Marsan, *Rev.* C. F., *O.M.I.*, *M.A.*
Martin, E. D.
Matheson, D.
Nicholson, M. Vernon.
Odlum, E., *M.A.* (Pembroke.)
Oxley, James M., *LL.B.*
Parris, Miss Oriana.
Parris, Wm.
Perley, Henry F., *C.E.*
Poirier, *Hon.* P. S.
Pratt, H. O. E.
Pugsley, J. W.
Rauscher, Rudolf.
Reed, E. Baynes. (London.)
Reid, Mrs. Annie M.
Scott, Miss Lilian.
Scott, R. D'Arcy.
Scott, Wallace, C.
Scott, Wm.
Scott, W. L., *B.A.*
Selwyn, A. R. C., *LL.D.*, *F.R.S.*, *F.R.S.C*, *C.M.G.*
Shaw, James F.
Small, H. Beaumont, *M.D.*
Small, H. B.
Smith, E. J.
Smith, Henry R.
Smith, W. H.
Sowter, E. T. W.
Steers, C. J.
Stewart, J. C.
Stewart, John.
Summerby, Wm. J., *M.A.* (Russell.)
Symes, Miss E.
Symes, P. B., *A.K.C.*,
Taylor, *Rev.* Geo. W. (Victoria, B.C.)
Thayne, E. Stewart.
Thorburn, John, *M.A.*, *LL.D.*
Tomlinson, J., *C.E.*
Tyrrell, J. B., *B.A.*, *F.G.S.*
Verner, J. W. D.
Watters, Henry.
Watts, J. W. H., *R.C.A.*
Warwick, F. W. (Buckingham.)
White, Geo. R.
White, *Lieut.-Col.* Wm.
White, W. R. (Pembroke.)
Whiteaves, J. F., *F.G.S.*, *F.R.S.C.*
Whyte, Miss Isabella.
Whyte, R. B.
Whyte, Mrs. R. B.
Wicksteed, R. J., *B.C.L.*, *LL.D.*
Willimott, Chas. W.
Woods, Samuel.
Wright, W. R.
Young, *Rev.* Chas. J, *M.A.* (Renfrew.)
Young, James.

ANNUAL REPORT OF THE COUNCIL.

To the Members of the Ottawa Field-Naturalists' Club:

The Council has pleasure in reporting that the work of the Club was successfully carried on during the past year. The number of new members elected was not nearly so large as in previous years, being only fourteen, but the membership may now be considered to have reached a point where a marked increase can be secured only by special effort on the part of each member.

One corresponding member was elected, the Rev. Abbé Provancher, of Cap Rouge, P. Q., who has rendered assistance to some of the members of the Club in various branches of natural science.

The Club Excursions were only three in number, owing partly to the prolongation of the last Session of Parliament, and partly to a somewhat unfavourable season. The first one was to Meech's Lake, on the 4th June, and, notwithstanding that the morning was showery and threatening, there was a good attendance. On the second excursion the Club went by steamer up the Canal to Long Island, a locality not previously visited by an excursion of the Club. Although held on the 14th of August, the day was chilly, rather than summer-like. The third excursion was to Brittania, on the 19th of September, and was well attended and most enjoyable, the day being bright, but cool.

The Saturday afternoon Sub-Excursions, or working parties, were more numerous and more successful than in any previous season, and were continued to late in Autumn. Many points in the neighborhood of the city were visited, and much was learned concerning the geology and the flora and fauna of our district. The Council was much encouraged by the attendance at, and interest shewn in these sub-excursions, and is convinced that in no department of the Club's work can more good be accomplished. The information gained at these weekly "Outings," and the instructions received from the Leaders of the various Branches could not fail to awaken an interest in field work in those who were present.

The additions to the Club Library during the year were numerous and valuable, and were received largely in exchange for our Transactions. Owing to the absence from the city during lengthened periods, of different members of the Publishing Committee, and to other unforeseen and unavoidable delays, the issue of Transactions No. 6, (Vol. II, No. 2,) has, the Council regrets to state, only just been made. The number contains 132 pages of letter-press, and two plates illustrating the new spieces of Crinoids described by Mr. W. R. Billings. A new feature will be found in a carefully compiled meteorological table, by Mr. A. McGill. The Transactions contain many valuable papers and should be placed by you in the hands of such of your friends as may be interested in science, or whom you would desire to become so. The cost of publishing them bears heavily upon the very limited resources of the Club, and it is desirable that a certain portion of it should be defrayed by the sale of some of the copies remaining after one has been allotted to each member. The winter course consisted of seven Soirées, of which one was a Microscopical evening very pleasantly and instructively spent in listening to short addresses on various subjects; and in examining slides illustrative of them. By invitation of our Vice-President, Principal Woods, of the Ladies' College, this Microscopical Soirée was held in the commodious assembly rooms of that institution. At the other Soirées valuable papers and reports were read as in former years.

Commencing on 11th January, Afternoon Lectures or classes were given each Monday, the last one having been delivered yesterday, so that the work of the Club has been continued by the Council to the latest possible moment. These classes were ten in number, and the attendance at them was decidedly larger than at those of previous years. The lectures were as follows:—Entomology: three by the President and one by Mr. Fletcher. Mineralogy: one by Rev. Prof. Marsan, (held in Ottawa College). Ornithology: one by Mr. W. L. Scott. Botany: two by Prof. Macoun and two by Mr. R. B. Whyte. By request of Principal McCabe, who was desirous of obtaining for the large number of students under his charge, the advantages of the lectures on Botany, the four lectures on that science were held in the Normal School, and were listened to with much interest by the

teachers and pupils, as well as by members of the Club and others who were also present.

From the foregoing report it will be observed that six of the meetings were held in the leading Educational Institutions of the city, proving that the Club is being more and more recognized as both able and willing to impart instruction in the Natural Sciences.

The Council has aimed to make the Club the organization naturally to be looked to for information, not only as regards our immediate surroundings, but on natural history in general, and has been pleased to be able to connect its work with that of the educational institutions mentioned. It endeavoured also to attract to the "Outings" and lectures, the student portion of the community, with a view to interesting the young people in its labours, and of educating them to a knowledge and love of nature.

Signed on behalf of the Council,

T. J. MacLAUGHLIN,
Acting Secretary.

16th March, 1886.

TREASURER'S BALANCE SHEET.

Dr. *The Treasurer in account with the Ottawa Field-Naturalists' Club, 1885-86.* *Cr.*

RECEIPTS.			EXPENDITURES.		
To Balance from 1884-85		$ 21 47	By Excursion expn's, 1st	$23 05	
Membership fees, 1885-86		122 00	" " 2nd	11 35	
Excursion Rec'ts., 1st	$23 50		" " 3rd	11 75	
" " 2nd	12 40				$ 46 15
" " 3rd	11 75		Transactions No. 6		100 00
		47 63	Printing		10 00
Soirees		1 50	Postage		3 22
Sale of Transactions		10 05	Stationery		2 55
Interest on Deposit		65	Book Binding		11 90
			Miscellaneous		1 25
			Balance to 1886-87		28 25
		$ 203 32			$203 32

T. J. MacLAUGHLIN,
Treasurer.

17th March, 1886.

REPORT TO THE ROYAL SOCIETY OF CANADA.

Read at the Fourth General Meeting, May, 1885.

As delegate from the Ottawa Field Naturalists' Club, I am able to report that the past year has been for it one of continued progress and success. Its two-fold work of studying local natural history, and of endeavouring to popularize science has been vigorously prosecuted and its membership has been largely increased. Forty persons joined the Club during the year, of whom several reside in distant parts of the country and have sought to evidence their interest in the welfare of the Club by enrolling themselves in its ranks. The membership is now one hundred and seventy.

Four large excursions were held last summer, at the first of which the Club was honored by the presence of many Fellows of your Honorable Society, and delegates thereto. Sub-excursions or "working parties" were also held on alternate Saturdays during the season, and contributed largely to a fuller knowledge of our geological formations and of our fauna and flora.

At the winter Soirées (six in number) "reports" by the leaders appointed in Geology, Botany, Entomology, Conchology, Ornithology and General Zoology were presented, and the following papers of much interest and value were read:—

The President's Address, H. Beaumont Small, M. D.
The Canadian Otter, W. Pitman Lett.
The Minerals of the Ottawa District, C. W. Willimott.
Wheat, (with special reference to that grown in Ottawa District) Wm. Scott.
Our Saw-flies and Horn-tails, W. H. Harrington.
Local Trenton Fossils, W. B. Billings.

Classes in Botany, Mineralogy and Ornithology were conducted during several weeks; the first named subject under the very interesting treatment of Prof. Macoun being specially attractive to the members and their friends.

It has been the aim of the Club since its formation to make its published Transactions as complete and valuable as its circumstances will permit, and Number 5, (Vol. II, No. 1, 152 pages) which was published during the year, is one which would be creditable to many older and wealthier societies. No. 6, which is now in the hands of the publishing committee will contain the reports and papers before referred to, as well as annual reports of Librarian, Treasurer, Council, etc.

The Library of the Club has received numerous valuable donations and exchanges, including the magnificent volumes of the Transactions of your Honorable Society, for which I am instructed to convey to you the thanks of the Club.

At the Annual Meeting of the Club, held on 17th March last, the following officers were elected for the year 1885-1886:—

President—W. H. Harrington.
Vice-Presidents—1st, John Macoun; 2nd, S. Woods.
Secretary—J. Fletcher.
Treasurer—T. J. MacLaughlin.
Librarian—W. L. Scott.
Committee—F. D. Adams, Henry M. Ami, Rev. C. F. Marsan.

W. L. SCOTT,
Delegate.

PRESIDENT'S INAUGURAL ADDRESS.

MR. W. HAGUE HARRINGTON.

(DELIVERED 10TH DEC., 1885.)

Members of the Ottawa Field-Naturalists' Club, Ladies and Gentlemen:

It is related that King Gustavus III of Sweden, during a visit to Paris, was waited upon by a deputation of savants from the Sorbonne, who congratulated him, among other things, on having as a subject and fellow-countryman a scientist so eminent as the chemist Scheele, the discoverer of magnesium. The King, hitherto entirely ignorant of the existence of the celebrated man, concealed as best he could the fact, and as soon as the deputation had retired, sent a message to his cabinet in Sweden that Scheele should be sought out and have the rank of Count conferred upon him. An official was sent forth to make the necessary enquiries, and returned with the information that Scheele was a lieutenant in the artillery, a good sort of fellow, who was a capital shot and played a first-class game of billiards. The Premier, acting on this report, created the fortunate lieutenant a count, and it was only on the return of the King that he became aware of the mistake, and that the renowned scientist was still living in obscurity as far as the court was concerned.

A mistake analogous in its character was made at the last annual meeting of this Club, when a humble sub-officer—a fair sort of secretary and a successful collector of insects—was burdened with honors which might have been gracefully and fittingly borne by one or other of our well-known scientists.

An unfortunate victim to circumstances, I had at that meeting the honor thrust upon me of election to the office of President of this influential Club; an office for which I felt myself totally unfitted in many important and, indeed, essential respects. While appreciating in the highest degree the honor conferred upon me, I am none the less convinced that the selection you made has not conduced to the best welfare of the Club. I have continued to regret that, yielding to the

representations of my friends, I allowed myself to be elected, instead of persisting to refuse this highest office in the gift of the Club.

My acceptance, albeit reluctant, was, I am still convinced, a serious mistake and detrimental to the interests of the Club, whose Presidents have hitherto been gentlemen having in a large degree the administrative power necessary to the office, as well as personal influences calculated to advance our general interests.

Various causes have combined to prevent the Council elected by you from devoting so much time as in former years to the management of the Club, however willing they may have been to perform the duties undertaken by them.

Yet, in spite of these drawbacks, the Club has made substantial progress, and a large amount of work has been performed in different directions. The membership has not been much augmented, but any such large increase as in past years is perhaps hardly to be hereafter expected. The persons interested in our labours constitute, unfortunately, a small class of the community, and of these, the number who have not already become members must now be few.

Still, if our work is properly organized and performed, we will continue, it is hoped, to awaken in others an interest in natural history, especially in the younger members of the community. These are now being trained in our various schools, and we should use our influence towards having the inportant truths of natural history presented prominently to them. Then when they leave school with an interest already awakened in the subjects to which we devote our investigations, we may look forward to their becoming fellow-workers with us, in order to continue their studies in sympathetic company. To this end we should strive to make our excursions and our meetings as inviting to them as po sible. Largely with this object in view an innovation has been made in our course of meetings for this season; an evening devoted to microscopic inspection of objects selected to illustrate brief papers on popular subjects being substituted for one of the usual papers.

A very gratifying feature of the summer's work was the increased and sustained attendance at the sub-excursions. These collecting parties, held each Saturday afternoon, were sometimes almost as well attended

as the regular excursions, and the presence of a number of young people was very encouraging. Good results may follow from the start thus made by them, and the collections commenced at these outings may before long become very valuable to their owners, and to all interested in the fauna and flora of this locality.

The printing of the Transactions has been unavoidably delayed, but it is now nearing completion, and when they are shortly issued to you they will be found a valuable contribution toward a knowledge of the natural history of our neighborhood.

A proposal has been made by Dr. May, of the Department of Education of Toronto, that this Club should make an exhibit at the Colonial Exposition, to be held in London next summer. As the Club has no collections, it will be possible to arrange for such an exhibit only by the co-operation and personal labors of those members who have collections in the several branches. Unless a display can be made that will do justice to the Club, and will give to those who may inspect it a proper appreciation of the work performed by us, it will be far better not to attempt one. A great deal of time and a certain amount of expense will be necessitated in the preparation and packing of collections. The cost of transportation will be borne by the Department of Education, which will take charge of them, and make the necessary arrangements for having them properly displayed in the section allotted to the Department.

It would be superfluous for me now to enter at more length into the work of the Club, either as already accomplished, or as planned for the remainder of the year. The reports from the leaders of the various branches will outline the results of our field-operations, while to the annual meeting the Council will, as usual, render an account of its stewardship.

The Inaugural Address by the President of any Society is always looked forward to as one of the most important lectures on its programme; and not unreasonably since the very fact of his election should indicate his ability to select an appropriate topic and to handle it in a suitable manner.

We had an admirable illustration of this a few evenings ago, when, in this room, we listened to the able and eminently practical address of one of our own members—Mr. W. P. Anderson—in his capacity of President of the Ottawa Literary and Scientific Society. Following him so closely, I feel quite overshadowed, and I sincerely fear that there are some here to-night who will be as much disappointed in my few remarks, as they were interested by his masterly treatment of a profoundly interesting topic.

The papers presented to the Club at these Soirées are, by its Constitution, restricted (and very wisely so) in their range; they must treat of the natural history of the locality, or be descriptive of original work done by the author. A certain license has, however, always been accorded to the President, so that, loosed from the chain that restricts his fellow-workers, he may have an opportunity of reviewing the work accomplished in other places, or of treating some inviting subject in a more comprehensive and liberal manner than he could otherwise do.

I am, however, unable to avail myself in any degree of the opportunity which has occurred to me. My time since the close of the collecting season has been fully occupied, and such portion of it as I could devote to the Club has been utilized in perhaps as useful a manner as the preparation of an Inagural.

I should like to be able this evening to read you a paper on our Hymenoptera, and to accompany it with a list of our species, prepared jointly by my esteemed co-laborer, Mr. Guignard, and myself. The mass of material collected by us during the summer renders it impossible to do so at present, as it will require a great deal of time to determine and arrange the specimens, and involve much correspondence and exchange with entomologists having special knowledge of this order. Many species new to science have also been discovered, and these must be described before they can be entered on our lists.

Unable then to treat of the subject to which my attention has been devoted almost entirely since my election to office, it has seemed quite impossible for me to select any topic which the time at my disposal, limited by work in other directions, would allow me to make of any value or interest to you. I have thought it better not to waste my own time in endeavoring to make a hurried compilation of a sub-

ject with which I am not familiar, and yours with a paper which would be probably of as little interest, as it would be of permanent value.

My address shall at least have one virtue—that of brevity—to recommend it to you, and shall consist merely of thoughts in connection wtih our pursuits, which have occurred to me within the past few days, but which for want of time have failed to crystallize into symmetrical forms, or to fall into regular combinations.

There is no more a royal road to solving the secrets of nature, than there is to fathoming the profundities of metaphysics, or to mastering the anatomy of dead languages. One must try the nearest by-paths, and must penetrate to her retreat by threading a very labyrinth of trails. But along no path can he far proceed without finding here a clue and there a clue which, if rightly understood, will bring him nearer to the goddess of his search. Her throne is at the converging point of innumerable paths which lead inward from an outlying sea of ignorance. These avenues may be sinuous and oft interrupted, but by them arrive to the pilgrims occasional glimpses of the radiance emanating from the central area. Morass and thicket may intervene, but no matter how treacherous the swamp or intricate the jungle, there will not be wanting objects of present encouragement and of incentive to further effort. At each step the ground will become more solid and the way less rough, so that the slow and wearisome labour of the outset becomes gradually a pleasant and absorbing recreation. The various powers are developed and strengthened by exercise, and progress becomes easier and more rapid with each stage completed.

What has thus been stated figuratively of the investigation of nature is also literally true in many respects. He who keeps to the dusty macadamized highway will have scant opportunity for discovery as compared with one who seeks the winding paths through field and forest. It is true that even along the roadside the observant naturalist will find much to interest and much to study, but after all the objects will be either common, or will belong to some family of aggressive and self-assertive forms. They will be the weeds that follow man along his highways, not the rare orchids that hide in the dim shade of the cedars and are nourished by the rich mould of the swamp. Or they will be

the sparrows, blackbirds and crows, noisy and troublesome, not the sweet voiced hermit thrush or the shy woodland warblers.

The field-naturalist then must be really of the fields; no collections of dried plants and insects, or series of skins and shells and stones should so engross his attention as to withdraw him from his rightful haunts.

To those who know anything of outdoor life, what a source of enjoyment is this wandering in fields and woods. At every step some object of interest is observed; a flower not hitherto noticed; a rare bird resting on its migratory journey to or from the north; a shy animal venturing forth from its secluded home, such, for instance, as the weasel in his winter garb, harmonizing so well with his surroundings, that almost alone by the glitter of his cruel bead-like eyes is he revealed, as he peers cautiously forth from a knot-hole in an old tree.

There are other inhabitants of the thickets to be found even when the ground is deeply veiled with snow and the murmuring of the streams is hushed. The partridge and the hare are still in their haunts, as the country lad well knows who has a line of snares laid across the tamarac or cedar swamp. With what eager uncertainty he visits them each morning, and how merrily he returns if successful in his frosty round.

The wary fox comes nearer to civilization as hunger presses, carrying his explorations as far as the poultry yard; and what a sight it is to see this beautiful animal, not fleeing for his life from a pack of panting, yelping hounds, but tripping his light course across the fields, or playfully rambling with his mate, and indulging in elegant and sportive gambols.

Let not the naturalist then desert the fields even in winter, under the impression that nought remains to observe. When the snow lies deep and the mercury is low, a tramp on snowshoes straight away across country, will have interests of its own, and will in addition make him fitter for the work of the study and cabinet. It is in the winter that these must receive most attention, and the library be made to supplement the work of the field.

No matter how minute our own observations, they can cover but a small part of the innumerable phenomena of nature, and it is absolutely necessary to study the publications of other workers in similar

fields in order that their discoveries may complete our own; and what is of equal importance, that they may enable us to judge of the value of the conclusions derived from our personal observations.

The naturalist must learn what there is to look for when he goes abroad, and in what manner to prosecute his search, or many of the most noteworthy objects will escape his attention. Mere rambling about the country, no matter how frequent or how prolonged, will not of itself suffice to make a field-naturalist. The bare-footed urchin following a winding stream with his piece of twine and bent pin hanging from a willow switch, is an embryo collector, but unless his attention is directed to something beyond the dangling of a worm or grasshopper before a sunfish's nose, he will never develop into a field-naturalist. Many a man has fished year after year, from boyhood to old age, and known little even of the prey he captured, while of the thousand other things that come so frequently within his sight he was utterly ignorant.

The angler, however, who is not entirely engrossed in his "basket" has rare opportunities of observing the sly frequenters of localities where animal and vegetable life alike are most varied. Along the margins of streams, and in meadows through which they flow, are the haunts and retreats of many of our mammals, reptiles and birds. Here also the rare plants seek retirement from the glare of the open fields, and find the moisture and shade so grateful and necessary to them. Profusion and variety of vegetation produce a corresponding abundance of insect life, which is augmented by myriads issuing from the water, and which, to a certain extent accounts for the number of birds which frequent the vicinity of streams.

How seductive do naturalistic rambles in the field become, when one has made some acquaintance with the multitude of objects which belong there. You come home parched by the heat and weary with walking on the dusty road, and think that it will be long ere you go forth again. But on the morrow when the sun shines, and the gentle south wind blows, you are eager to be forth even at the risk of the same penalties. It seems to you that there is something that you overlooked the previous day, or something that you require again to investigate, and that you should at once go to complete your observations.

The portion of highway that it is necessary to plod, is as speedily as possible left behind and forgotten; and once more, among the grass and flowers, you hear the songs of birds and the murmur of insects. How many things there are to see, and how swiftly the time speeds, as plant and bird and insect bespeak your attention.

And when at length fatigued by rambling, what couch more restful or inviting than the soft elastic cushion of sward on the slope of an upland pasture, under the shade of some broad beech or oak, and fanned by whispering breezes from the meadows. Or in the pine grove that crowns the hill, how luxurious is the fibrous bed of leaves shed from above, year after year, and how grateful the resinous odor of the air. The shrill continuous song of the cicada may seem the sole sign of life, but it is really one of many. Grains of sawdust trickling down the furrowed bark of an old trunk indicate that a colony of ants are industriously honey-combing the interior, and closer inspection will show continuous columns of these little toilers moving between the ground and the upper portions of the tree. A falling cone proclaims the presence aloft of a squirrel which has temporarily been in a state of unwonted quiet, but which on detection commences to chatter in his most saucy tones. A woodpecker's tap, tap is heard faintly in the distance, and other familiar sounds are soon noted and their producers seen.

And if, lulled by "the murmuring pines," you should yield to slumber's charms, what cunning explorers will come stealing about you. Little "stripes" the chipmunk, will wink and grin at his cousin "bushy-tail," and dare him to venturesome deeds, perchance even to scampering over the prostrate giant. The pretty little wood-mouse will extend its rambles, from the hollow log in which it has its nest of fine dry grass, to forage for seeds. Wood-creepers, chick-a-dees, warblers, and perhaps rare birds for which you have long watched and waited, will sport through the branches above you, and twitter and chirp their comments on your appearance.

To observe the varied life of the woods in the closest manner, and to gain a knowledge of the actions and voices of the resident or passing forms, one can do no better than to seek a favorable locality, and then sit or lie motionless until his presence is forgotten, or forgiven. The

slightest movement will cause the shyer species to vanish, and will check the free motions of many others.

Early morn is, however, the time when the woods ring with the songs of the birds, and are filled with the sights and sounds of prolific life. As the sun gains in the heavens the inhabitants, except the insects, become quiet, and disappear largely from the scene, occupied, perhaps, with their family and household cares. Insects are most abundant during the hottest portions of the day, for these small creatures, with numerous night-flying exceptions, love the light and heat, and clouds or showers send them at once to seek shelter. Toward the close of day, bird life becomes once more active for a brief period, and as the shadows deepen the nocturnal forms of life appear.

What a constant succession there is throughout the year of changes and varieties in the surroundings of our rambles. In the spring comes the budding-forth of leaf and flower and the reappearance of the myriad animated things of earth and air and water. It always seems as if nature was holding a jubilee over the departure of the frost king, and the withdrawal of his forces. The songsters, northward wending, fill the thickets with melodious carols as the sun, rising earlier each morn to welcome them, throws his first rays across the tree-tops. Even the cold blood of the reptiles seems to flow more warmly, and their voices pipe full and clear from every pool and swamp. Plant after plant at its appointed time blooms out, increasing yet more the lavish decorations, and the bees, toil they never so briskly, cannot garner all the honeyed sweets they offer. With summer comes the fruitage of the fields, when the strawberry and its succulent relatives entice to the meadows many whom the mere beauties of foliage and flower have no power to charm. Then as flower and fruit fail, and the foliage, tossed and torn by the winds and mutilated by insect foes, has lost its freshness of color, the plants make a final effort to regain their beauty; and with what success one need not ask who has witnessed the wealth of coloring which adorns our trees in autumn. What combinations of scarlet, gold and green our maples wear; how rich the browns and purples of the oak; how the sumach flames out on the hillsides, among the yellows of the birches and poplars. The very ground is hidden by such a brilliant, luxurious carpet that walking over it seems the realization of some

eastern tale, where palace floors are clad with rich, soft mats from Persian looms.

The winds grow colder and fiercer, and the leaves whirl earthward until the trees stand bare once more, and yet there are patches of bright color remaining here and there. The coral berries of our Canadian holly hold long to the naked twigs, as in a less degree do the larger and more fleshy fruits of the hawthorn. The mountain ash also bravely holds its great clusters of berries as food for the red-breasted grosbeaks. Of winter mention has been previously made, so that the circuit of the year is complete, and each season is found offering something worthy of attention.

One important feature of the winter, that must not be overlooked, is the opportunity it affords of studying and arranging our collections; how, otherwise, should we find the time for this essential work. And as we pursue it what a throng of memories is called up by each specimen; the time and the locality, and, if you were not alone, who your companion was. A sympathetic companion I may here remark adds immeasurably to the pleasure and success of a field trip. Two pair of eyes are better than one, and many things that would have escaped your notice are pointed out by a companion, while, on your part, you will shew him much that is new and of interest.

It should be the aim of each member, who has opportunities to contemplate and enjoy the beauties and wonders offered by our fertile and varied neighborhood, first to avail himself fully of his privileges, and then to endeavor to enrich others with the results of his labours. What has been told is but a page at intervals in the history of our surroundings, and as our President last year pointed out to us, there remains much entirely neglected. To chronicle the movements and habits of our birds alone, would require numerous papers, which might be made deeply interesting to us. Scores of our birds, if carefully studied, would each suffice for a paper, pleasing and valuable.

And so it is in other branches; we have lists, and occasional notes on species, but no completed life histories, except in rare instances, as Mr. Lett's of the Otter. This paper, although not exhaustive, I consider one of the most valuable of our contributions toward a knowledge of

our animals. It speaks at once of intimate acquaintance with the creatures described, and of a close observance of their habits.

In placing before our fellow-members the record of our labors in the field and in the study, we should, I think, aim to do so in as pleasing a manner as possible; not content merely with exhibiting a well articulated skeleton, but striving to give it the rounded outlines and colours of life. There is a charming quaintness of description found in the works of many old writers on natural history, but to us a certain portion of it is frequently due to changes in the language, and sometimes unfortunately, to the imperfect knowledge which is shown of the subject.

But we need not turn to musty tomes to find charming writings on nature, when we have those of such observers as Grant Allen, Burroughs, Abbot, Merriam, and others that come readily to our memories. These are the books to read on wild winter nights, and to call up familiar forms and voices from all the seasons. They have the flavor of the outdoor world of which they treat. The murmuring of waters; the songs of birds; the breath of summer winds through odorous thickets; the blossoming of flowers; the myriad sounds and forms of nature, animate and inanimate, are stored for us in their pages. Perhaps here or there we find errors, but they are rare, and we who know how difficult it is to avoid mistakes, should be the last to cast a stone at such careful workers.

Sit down with paper and pen and try how much you can write about some species with which you are familiar, and you will probably be surprised to find how little there is regarding it of which you are absolutely certain. Unless your memory for details is much better than mine, I fear your history will be far from exhaustive. It is easy to believe that you are fully acquainted with a certain form, that you know where and when it appears, and its manner of life and reproduction, but when you attempt to record these, doubts commence to flit through your mind and your knowledge seems less assured.

These points I mention merely to accentuate the value of carefully kept and well filled note books, from which to draw in such times of need. These, if the entries are properly made, *i.e.*, on the spot and at the time when the fact noted was observed, are of equal interest and value with any collection, except, perhaps, one of living forms.

Nearly every true naturalist has, in varying degree, the faculty, not only of artistic perception, but of execution, as evidenced by the illustrations that so many of them prepare to accompany their writings. We need not go beyond our own membership for instances of this, and every one who studies nature should endeavor to cultivate this admirable gift. A few strokes of the pencil are frequently more effective than much labor with the pen.

Crude and incomplete have been the views which I have endeavored to sketch of our duties, pursuits and pleasures as field-naturalists; discursive as rambles in the field, and noting but few of the many important objects which should receive our attention. I cannot hope to have interested all present, but if any have found here or there a suggestive thought, or one illustrative of their own ideas as to our aims and the method of their accomplishment, it will be ample recompense to me for the scant hours which I have been able to devote to the most onerous duty of my office.

THE BLACK BEAR.

WILLIAM PITTMAN LETT.

Read 14th December, 1885.

The black bear (*Ursus Americanus*), is a native of the Ottawa Valley, as of nearly all the wooded parts of North America; except, perhaps, the south-western portion of the continent. This animal, in a mature state, has three incisors, one canine tooth, or tusk, and six molars, in each side of the upper jaw, and three incisors, one canine and seven molars in each side of the lower jaw. I quote the following description from the "Canadian Naturalist and Geologist," which, from personal observation, I find to be correct:—

"The black bear has very short legs, a somewhat bulky but flexible body, a long head, slightly arched from the nose over the forehead, small eyes and ears high, oval and rounded at the tips. The soles of the feet are short, the hairs projecting slightly beyond the claws, which are short, blunt and somewhat curved. The tail is very short and the fur is long, glossy and soft. The general colour is black, but sometimes varies to brown or yellowish at certain seasons. The sides of the nose are of a fawn colour, and there is sometimes a small white spot on the forehead and throat. The length of the animal is from four to six feet, and large ones, when fat in autumn, weigh from three to five hundred pounds. The female brings forth two cubs in the winter, or at sometime before the hibernating retreat is deserted."

To the foregoing description I would add, that the young of the black bear are produced during the month of March; and also, the singular circumstance attested by all hunters, that before, or after the hibernating season, no she bear has ever been killed showing any evidence of being in a gravid state.

For such a large animal, the cubs of the black bear are exceedingly small. Some that I have seen, apparently a couple of days old, were not any larger than kittens of the same age. Naturalists have been puzzled to account for the singularly diminutive size of the cubs. No reasonable conjecture of the cause can be formed from the anatomical

structure of the animal. I believe, however, that the same peculiarity distinguishes the young cubs of the grizzly and all the other species of this genus.

Bears feed principally on vegetable food, such as grapes, roots, berries, beech nuts, oats and Indian corn. In plundering the oat and corn fields of the farmer they often meet their death by means of traps, spring guns, and watching from scaffolds by night. In remote places, where they have not been disturbed, on fine evenings, bears always visit fields of corn or oats before sundown, and thus become an easy prey to the watcher, who is seated perhaps twenty feet from the ground, and, as a consequence, safe from being scented by the animals.

Black bears are inordinately addicted to honey, and, like Gulliver among the Lilliputians, they strike on a troublesome trail when they attack a bee's nest. In the late fall they devour the berries of the Rowan tree, the heavy red clusters of which afford them a rich repast. In a place on the slope of one of the mountains north of Chelsea, where I was out deer-hunting last October, a little grove of beautiful Rowan trees which was much trampled down and tattered by bears in getting at the fruit, together with numerous tracks, indicated the very recent presence of these animals in the place. The black bear, when his natural food is scarce, as is the case when the berry or nut crop is deficient, takes boldly to the farm yard, and carries off pigs and sheep, and even kills young cattle when pressed by hunger. Under such circumstances hunger makes him exceedingly fearless. I have known more than one incident in which bears have been killed, in the act of worrying pigs, by a few blows of an axe.

Although a somewhat clumsy animal, the activity of the bear is wonderful. For a mile or two he runs with astonishing speed. When closely pursued by dogs he will take to a tree, up which he can climb rapidly; from which, however, he descends more slowly, head upwards, as soon as it appears safe to do so. A bear will seldom take to a tree when pursued unless to escape from dogs which take hold, or from a large pack that terrifies him. So far as I have observed, bears are very shy and timorous in the presence of man, making off rapidly from the sight or scent of a human being the instant they become assured of either. They are, however, more frightened by the scent—that intang-

ible terror of the wilds—than by the appearance of man. The she bear, when accompanied by her cubs, will show fight in their defence, if they are meddled with; yet not always with that self-sacrificing devotion which some writers would lead us to imagine. I once had a personal—and it might have been a dangerous—encounter with a she bear, the largest animal of the kind I ever saw. She had two cubs with her, and the result of my stirring interview with this maternal bruin did not give me a very high opinion of her courage, even in the defence of her young. At a distance of six feet she growled savagely, and showed her teeth viciously; but when my gun missed fire twice, she turned tail and ran away with all her speed, leaving her cubs behind her. This littie hunting episode occurred in a fine open hardwood bush, with a soft carpet of moist leaves ou the ground. I was young then, and thought I could run as fast as a bear; but I shall never forget the ignominious manner in which I was distanced. With my two terriers I chased her to the edge of a swamp about a mile off; and, although I ran back to the starting point, at a good pace, I found her there before me. She would not afterwards allow me to get within shot of her. I wanted badly to kill a bear; but it was in the days of flint locks and short ranges. Had I possessed a Snider, a Ballard or a lightning repeater, I should have laid her out at first sight in half a minute. After all, perhaps the two dogs—although much less dangerous enemies than their master—frightened her more than I did. The cubs were young, and I have often since been glad that my gun missed fire. Black bears are caught in steel traps, and in timber "dead-falls" set in their places of resort. Steel traps are also successfully used at certain trees to which bears are in the habit of resorting for the purpose of scratching the bark, with what intent can only be conjectured. Some have thought that they do it for the purpose of sharpening their claws. Others have imagined that the act is peculiar to the pairing season, and that the tree thus marked becomes the trysting place, and it may be a battle ground. By the height of the marks left on trees by bears, the animals must have stood erect on their hind feet while performing the cat-like operation. I once saw a large balsam tree in the wilds of the Madawaska River, deeply scored and torn by the claws of bears at a height of at least seven feet from the ground. Steel traps are frequently set in corn and

oat fields where "bear sign" has been found. The usual and most approved mode is to fasten a log of sufficient weight to the chain, which the animal, when caught, drags after him, leaving a well defined trail which can be easily followed. The hunter who follows this trail must be careful that he does not come suddenly or unconsciously upon the fettered animal. A few years ago an old man named John Dennison, a former resident of Ottawa, in crossing a fallen tree, came suddenly upon a large bear which was fast in a trap that he had set, and a terrible encounter only ended with the death of both. When seized the old hunter attacked the furious animal with his hunting knife and succeeded in killing him, but, unfortunately, not until he was himself mortally lacerated. Man and bear were found lying dead together. This happened at Bark Lake, on the Madawaska River.

Bears are possessed of great strength and astonishing activity. I knew an instance where a black bear climbed twenty feet into a tree with a heavy steel trap fastened to one of his hind feet, and a log of at least fifty pounds in weight attached to the chain. Dead-falls for bears are frequently baited with fish, of which they are quite fond. When food is scarce on land, bears have been known to wade and swim in the rivers of British Columbia and other places, for the purpose of catching fish, particularly when the streams are crowded with salmon making their way inland to spawn. They are constantly seen along the coast of the Island of Anticosti devouring herring spawn, which is cast up there in vast quantities by the waves. The black bear is a good swimmer, although much slower in water than a deer. In their rambles through the woods they swim across rivers and lakes, and are often killed in the water by hunters and others in canoes. Should a party without a gun, an axe, or a good stout pole, encounter a bear in the water, I should strongly advise them to steer clear, for, under such circumstances, he would prove a dangerous antagonist. I have heard it said by those who have tried it, that, if a good strong pole is laid across the back of a bear's neck, when he is swimming, he will instantly raise his fore-paws and catch a firm hold of the pole on each side of his head, and by this means draw his head under water and drown himself. It is affirmed that, when in this position, in water, the animal cannot detach his feet from the pole. I have never had an opportunity of

testing this kind of bear-hunting, but I have sufficient faith in the possibility of its success, to attempt it should a chance present itself. However, all things considered, in an encounter with a bear, I should prefer a double-barrelled shot-gun or a repeating rifle. Sometimes, however, without firearms very clean certain work has been done, even on land, in conflict with a bear. In this connection I shall tell you a story, as nearly as I can recollect it, relating to the killing of a large bear by the late Mr. Billings—the founder of the Billings family here—in the year 1825 or 1826, or earlier, somewhere between Sparks street and the Rideau River. Mr. Billings, accompanied by one of his men, was on his way home, either from the older village of Hull or "The Point," for even Bytown was then unknown, when they encountered a large bear in their path. The animal sat up and apparently disputed the pass. Mr. Billings cut a good hardwood pole about ten feet long, one end of which he sharpened with the axe. This lance-like weapon he handed to his assistant and instructed him to walk quietly up and make a strong, quick thrust at the breast of the bear with the sharp end. This was done, upon which the bear grasped the pole with both fore paws, and pulled upon it suddenly and with such force as drew the weapon further into the wound. Just at this crisis of affairs Mr. Billings quickly stepped forward and finished the business with a few blows of his axe. In illustration of the danger to be apprehended from a wounded bear, I shall relate an incident which came under my own observation about the time when I first went on the war-path with a muzzle-loading flint lock. A man named Daniel Hannegan, who then lived in the village of Richmond, went out one evening in the month of August, 1839, accompanied by a young man named Robert Stanley, and set a gun in a field of oats on the outskirts of the village. Having completed their arrangements, the hunters climbed to the roof of a barn in the centre of the field to await the result. Shortly before sunset the bear came in, and walked straight across the line in front of the muzzle. The gun went off and sent two one-ounce bullets through the body of the animal, a little too low, however, to drop him in his tracks. The wounded animal made slowly for the woods, followed by the men. When Hannegan, with a reserve gun, got close enough, he fired a second shot and wounded the beast again, and was advancing close up to

him, when the bear turned and charged him with open mouth. The proverbial "fierce and angry growl" was not heard, but the attack was so sudden and unexpected that Hannegan was obliged to back up, when his heels, coming in contact with some obstruction, he fell on his back, and bruin instantly descended upon him, "tooth and nail." The infuriated animal caught one of his hands, which he had raised to defend his face, in his teeth and passed his great tusks through it in several places, and lacerated various parts of his body dreadfully with his claws. Although almost in the death struggle, the savage animal would certainly have killed his antagonist had not Stanley opportunely arrived on the scene, and quickly dispatched him with an axe. This was a very large bear; and I can vouch for the fact that it was three months before the wounded man was sufficiently recovered from his injuries to go bear-hunting.

According to Godman's "Natural History," black bears have been observed in the vicinity of Hudson's Bay, in the month of June, before the berries are ripe, feeding entirely upon water insects, which are driven into lakes and bays in prodigious quantities by gales. The animal swims along with his mouth open and gathers the insects on the surface. This species of food imparts a very disagreeable taste to the flesh of the bear, which, in my opinion, is not very agreeable under ordinary conditions, with the exception, perhaps, of the hams, when nicely cured and smoked. The hams of two large bears which I shot on the south side of Rideau street, near Nicholas street, were treated in this manner and proved excellent.

The black bear fights with teeth and claws, and by hugging, to which latter peculiarity many a good dog owes his death. When in an erect position the bear is a perfect master of the manly art of self-defence. It would puzzle a pugilist of either the light or heavyweights to get in a blow when he is in this position. The most vulnerable part of a bear is his nose, which is provided with many sensitive nerves intimately and directly connected with the brain. When a bear is standing on all fours there would be no difficulty in striking him with a club. But when he is sitting erect it would be an entirely different matter. An expert swordsman might be able to reach him with a rapid thrust; the scientific Tipperary man, with a blackthorn, never.

The black bear is easily tamed when taken young, and, for the first six months of captivity, makes an amusing and interesting pet. As the animal increases in age and size it becomes unmanageable, treacherous, and ultimately, positively dangerous. It can then only be held safely by means of a strong collar and chain; and can be mastered and kept in subjection by the person alone who obtains the ascendency by the most violent methods of inducing docility. Bears cannot be recommended as domestic pets. More powerful, but not less treacherous, than foxes, they are far less docile and affectionate in a state of domestication than wolves.

In Canada black bears retreat to their dens—generally under the roots of large trees, or occasionally in rocky caves—in the first part of December, or a little earlier or later, as the season of confirmed frost and snow sets in. They remain there in a quiescent state, although not in a trance-like condition of torpidity—until the first or second week of the month of April, or the latter part of March if the spring is open. The facts relating to their state during the period of hibernation which I have mentioned, has been well established by hunters who have killed them in their dens in the depth of winter. I have also verified it in the case of one kept in a state of domestication. I know of nothing authentic as to whether they suck their paws in hibernation or not, although this is asserted. Some naturalists who have studied the subject carefully, have concluded that the hibernating slumber is occasioned by an increased slowness of the circulation of the blood, superinduced by the colder condition of the atmosphere during winter; and that the physical transition through which they pass, cannot be considered as a state of absolute torpor. In proof of this can be adduced the well known fact that, when attacked or wounded in their dens, they become at once wide awake and aggressive. When they first emerge from their four months' slumber, bears are heavy and fat, and their fur is in prime condition, but shortly afterwards—owing to the scarcity of food in the early spring—they fall off in flesh and soon become ragged in coat and lanky in appearance. Towards the month of October, if they have had a favourable summer, they are found in good condition, and any time after the middle of November their skins have the finest colour and the thickest and heaviest coat of fur.

Bears are extremely fond of beechnuts. In the fall they make great havoc among the branches, where they are sometimes shot by the hunter, being then, while busily engaged in feeding, less watchful than usual. They also tear up old stumps and rotten logs in search of grubs, and larvæ of insects, and ants. Except to escape from dogs, or when in search of nuts, bears are seldom seen in trees. They will run long distances before hounds, if not attacked by them, without climbing. When overtaken by dogs they sit erect and defend themselves with great dexterity until they catch sight of the hunter, when, if not too late, they immediately continue their flight.

Black bears are very tenacious of life. A bullet must be well placed to knock them over in their tracks. After a bullet has actually passed through the heart, this animal—as is often the case with a deer—will sometimes run fifty or sixty yards before he drops. Two large bull terriers and a third dog—a cross between the bull dog and blood-hound, to do the scenting—would prove a match for the largest black bear. His pugilistic tactics, although certain to prove successful against the attack of one, would be of little avail against the onslaught of two such dogs. I have seen this tried and know the result.

Bears are still to be found within eight or ten miles of the city of Ottawa. According to authentic reports they have been quite abundant this season in the more remote and less settled districts of the Ottawa Valley. About ten years ago a bear frequented the bush on the Mac-Kay estate, near New Edinburgh, for a number of weeks. Another was frequently seen, about the same time, during the autumn and until the time the snow set in, in the woods around Brigham's Creek, on the Quebec side of the Ottawa. I spent an afternoon following the old tracks of the latter animal, but failed to find him. About thirty years ago a large bear was killed on the Gatineau, which was about as light in colour as the Polar bear. The hair of this animal was very coarse, although the inner fur was fine. Whether this animal was a *lusus naturæ* or a solitary wanderer from the Arctic Circle, it is difficult to say. From its general appearance and anatomical structure, I am inclined to believe that it was the former, and belonged to the black species. Its appearance was as unaccountable as the white variety of the Virginian deer frequently met with in the Ottawa Valley.

Bear skins are used in the manufacture of fur coats, sleigh robes and other useful articles, not forgetting the formidable looking head-gear of many regiments of the British army, which so often has terrified the enemies of Britain. The deep, glossy skin of the black bear renders it peculiarly beautiful, and its warmth, arising from its thick coat of fur, is highly desirable in the cold weather of our Canadian winter.

A few words in conclusion. It it is not my intention to moralize at any great length upon the want of practical adaptability so painfully apparent in much of the legislation enacted for the preservation of game and fur bearing animals, game birds and fish. To be practically useful and effective, all such laws ought to be founded upon a sound knowledge of the haunts and habits of the animals intended to be protected, without regard to sectional prejudices or mere local influences. I cannot but regret that the public mind has not yet been adequately aroused respecting the national necessity for the complete, stringent and practical protection and legal preservation of our animals. The stable will probably be locked after the steed has been stolen. This will be but a poor consolation to the coming generation which, I much fear, will have tangible cause to regret the apathy, neglect and destructiveness of to-day, which leads to the lamentable extermination of game and denudation of our forests. In an agricultural point of view, Canada would be much better off with a larger area of standing timber, and not a bit the worse of having double as many wild birds and wild animals as can now be found within its borders. Even the black bear, which is ruthlessly slaughtered in all seasons, is, in my opinion, of sufficient importance to entitle him to that degree of legal protection which he has never had. No more utterly forsaken and desolate prospect can be imagined than that of a country unwisely stripped of its forest trees, and without the wild animals and birds, which contribute so materially to the value, interest and beauty of the wilderness.

WATER CRYSTALLIZATION EFFECTED BY MAGNETISM.

Mr. E. Odlum, M. A.

Read 29th January, 1886.

It is regretted that the funds available for the publication of this number of the Transactions do not permit of printing *in extenso* this paper (which, however, does not especially deal with local natural history), for the publishing committee has found it impossible to satisfactorily condense it, or to make an abstract that would fully and clearly present the views of the writer. He describes numerous phenomena connected with the freezing of water under different conditions, and endeavors to show that they give ample evidence of magnetic influence as a prime factor in crystallization.

MICROSCOPICAL SOIRÉE.

Held 12th February, 1886.

As a variation from the ordinary soirees, one evening of the course was set apart for the examination of microscopic objects, and it proved to be a very pleasant and instructive meeting. By invitation of Vice-President Woods, the soiree was held in the assembly rooms of the Ottawa Ladies' College, of which he is principal. A large number of microscopes and slides were loaned by the members of the Club, while several of the teachers and pupils of the college contributed to the enjoyment of the evening with music and songs. The President made a few brief remarks on the advantages which the Council hoped might result from the meeting, and announced the programme, which was opened by a piano solo by Miss Hart. Prof. Macoun then gave a brief description of vegetable tissues. The space of ten minutes was then devoted to examining slides illustrative of his remarks, the same course being

followed with reference to the several speakers. Mr. J. F. Whiteaves described deep-sea dredging, and outlined some of the work undertaken by various governments. Specimens obtained from the Gulf of St. Lawrence and elsewhere were exhibited. Mr. F. D. Adams explained the origin and formation of lava, and showed sections obtained from various places. After a song by Miss Nellie Woods, entitled, "The Vision Beautiful," an intermission permitted those present to have a few minutes conversation, or to examine any slides which might be specially interesting to them. Miss Katie Cameron followed with a song, "Marguerite." Some magic lantern slides of blood corpuscles and other animal structures were shown by Dr. Wicksteed. Mr. J. B. Tyrrell described the forms and habits of some parasites, numerous slides of which were examined. Mr. H. M. Ami described the preparation of vegetable infusions, and some of the commoner forms found therein, which were viewed with much interest. Mr. T. C. Weston had on exhibition a collection of *Eozoon Canadense*, consisting of specimens in mass and in microscopic sections, and of photographs, which had been specially prepared to be sent to the Colonial Exhibition. Miss Denzil and Miss Cameron sang a duet, "When the Wind Bloweth in from the Sea." After a vote of thanks to Principal Woods for the use of the college rooms and to the ladies for their kind assistance, the meeting concluded with "God Save the Queen."

A NEW DEPARTURE IN THE STUDY OF MINERALS.

Rev. Prof. C. F. Marsan, M.A., O.M.I.

Read 18th February, 1886.

It is a subject of wonder for a careful observer how few among intelligent and well educated persons devote themselves to the study of the natural sciences. The beautiful and wondrous things which God has created and scattered, with a lavish hand, in man's way attract very little of man's attention. Their superficial beauty may occasionally recreate his senses, strike his fancy, if he is anything of a poet; but the very cause of that beauty, the laws that preside over nature and unite all in one sublime harmony, too frequently escapes his notice. Among the sciences which relate to this our rich earthly inheritance, Mineralogy, the oldest by its object, yet the youngest born and latest developed in the human mind, holds a prominent place. Having for its object the very material of which this earth of ours is composed, and closely connected as it is with the all important sciences of Chemistry, Geology, Botany, Zoology and Astronomy; the industrial and economical interests which spring from it, which lingered during its infancy, grew with its growth, and yet await its final development in order to raise the material wealth of nations to its maximum, have all contributed to promote the study among the scientists of this country; but all these reasons have not been sufficient to bring the average student into close contact with the science of minerals and rocks. It would carry me beyond the limits of my plan were I to enquire into the causes of that neglect; let me point out only one cause, the consideration of which will form a natural introduction to the subject of this discussion. Mineralogy, though now raised by the immortal discoveries of Hauy, to the rank of a science with a complete system of classification, has not yet been presented to the beginner and student in a way to render it both logical and attractive. In other words, the system generally followed in teaching this science is not in keeping with the high standing of the science itself; it is defective in more than one respect. Such, at least, is the opinion which I propose to defend.

In the first place I must say that though Mineralogy is undoubtedly one of the natural sciences; it would be taking a false view of it to compare it, so far as system and classification are concerned, to the other branches of natural history. It must be admitted that mineral species are produced in nature each according to its own character and properties and are as clearly distinguished from one another, even in external forms and structure, as the most absolutely defined species in any of the higher kingdoms of Botany and Zoology. But if the distinction is as complete, the principle of that distinction is not the same as in plants and animals. The tree which rears its lofty head in our forests, the mollusk that lives out its unknown existence in the "dark unfathomed caves of ocean," the fish that seeks its prey in the highways of the deep, the brute mammal that would seem almost to have reached the apex of created perfection, had not God given to nature a foreign king, by breathing a spiritual soul into the material body of man—all these, even man himself, are formed of matter, subject to the laws discovered by Physics and Chemistry. But in all these another principle asserts itself: Life, that mysterious power whose mighty influence is so clearly visible in the external form and internal structure of plants and minerals that it must also necessarily rule the whole of those sciences that have the higher created beings for their object. Biology, Physiology, Anatomy regulate the whole system of the Botanical and Zoological sciences, and in spite of all the progress of modern chemistry, I cannot believe that it will ever be found necessary to label any vegetable or animal species with its chemical formula or the percentage of its component elements. In Mineralogy the case is quite different. The mineral, free from the influence of life, is entirely subject to those chemical laws which hold exclusive sway over all inanimate matter. In fact, between the mineral properly so called produced by nature, and the artificial substance produced by the chemist in his laboratory, there is no specific difference. The same laws have presided over the formation of each with this difference only that in the one case the necessary conditions were fortuitously combined by natural agencies, whilst in the other they were intentionally set by the intelligent scientist. All substances, therefore, which have a definite composition, whether occurring in the rocks or artificially prepared, belong to the same

kingdom of nature. This fact, however, does not impugn the correctness of the distinctions usually made between the natural and artificial substances or the propriety of the terms mineral and mineralogy used solely in connection with the former.

I admit the propriety of distinguishing minerals from other chemical substances; but I think it illogical to give the imaginary line of demarcation drawn between them as a sufficient reason for following a completely different method in the study of each of the groups thus delineated. It is not our arbitrary conventions, but the very nature of things, that ought to suggest the proper line of action in this as in all other studies.

I am, therefore, convinced that mineralogy cannot be independent of chemistry, and in chemistry I include even the study of crystalline character. In this extended application of the word chemistry, I follow the example of Cooke, Bendant and other far-seeing scientists, who, in spite of present difficulties and apparent contradictions, foretell a time when chemistry and crystallography, studied from a higher point of view, will infallibly lead to the same conclusion, and become, in fact, one and the same great science of the constitution of matter.

My remarks, however, in this paper will apply exclusively to Chemistry in its restricted sense, as Crystallography receives a due amount of attention in our present system of studying Mineralogy. I must here forestall an objection. My objector would say something to this effect: "You are pleading for the dependence of Mineralogy upon Chemistry, but is not this fully realized in the system now followed by almost all authors on Mineralogy?" My answer is that you are partly right and partly wrong. Most authors on Mineralogy, and, in fact, all of such as are authorities on the subject, hold that chemical composition, together with crystalline form, must be the basis of classification in Mineralogy. They follow that principle: first, in deciding whether a certain class of specimens constitutes a new species or is simply a variety of another already described species; secondly, in grouping together minerals similar in composition. This is amply sufficient to demonstrate that they accept the above mentioned principle of the dependency of Mineralogy upon Chemistry. But is that principle practically followed in such a manner as to induce the student to look to Chemistry as the

only natural road to Mineralogy? I think not. I have frequently used the best American text-books on Mineralogy in my classes, and in my own researches, and I have arrived at my conclusions, notwithstanding the ability they display in setting forth the present methods of that study. Requesting therefore a continuance of your very kind attention whilst I explain to you the working of that system, I hope to succeed in persuading you of the necessity of making in it certain innovations.

A complete course, even of elementary Mineralogy, includes three divisions—Theoretical Mineralogy, Descriptive Mineralogy and Determinative Mineralogy. Those among my readers who have devoted an occasional leisure hour to this study are familiar with these expressions and know exactly the object of each of those departments of the science. Authors on Mineralogy do not usually treat of all the three divisions. When they do, they generally write a separate work on each. Thus the great American mineralogist and geologist, James D. Dana, has published "A Complete System of Mineralogy," including all the principles of the science and especially the mathematical intricacies of Crystallography. In another work under the same title he gives a description of all the species known. But he left to his confrere, Mr. Brush, the honor of publishing a Determinative Mineralogy. Now it is evident that a text-book intended to convey to the student an adequate idea of the science, not of course of all its details, but of its entire system and general features, must embrace the elements of all the three divisions. Give the student nothing more than Theoretical Mineralogy and unless he is a born mathematician, how can you expect him to solve the mysteries of the famous six systems, letter the planes resulting from the fiftieth successive truncation of a crystal, without ever hoping to have a tangible proof that all those fantastic figures have not been systematically devised to puzzle his poor brain, and give him a higher course of pure solid Geometry in disguise. So much for the attractiveness of the study. But, leaving that altogether aside, place in the hands of the student a long list of species more or less connected; require him to remember the crystalline form, possible structure, capricious cleavage, variable colours, doubtful lustre of every mineral. Give him no credit if he does not give its hardness and its specific gravity to

three decimal places; lower his record if he forgets the fractions of a minute in the angle between all primary and secondary planes, the angle of refraction, of polarization, etc., etc. Now, if you succeed in obtaining that from any student, you have unearthed a prodigy; your victim has accomplished a feat equal, if not superior, in point of lively interest, to the learning of the old Greek roots, which, some say, could only have been extracted from the devil's garden; or the operation of conning an answer to a few hundred problems, without ever knowing how one of them was obtained. You have developed his bump of memory, but at the imminent risk of permanent injury to his bump of common sense. Finally, Determinative Mineralogy, if not studied in connection with the two other branches, offers no better advantage; for, though after going through a series of mechanical experiments, and then laying your hand on a mineral, you turn over a few pages of Mr. Brush and say: This is the name of my specimen, you do not know the reason of your statement. You are ignorant of this mineral's place among the various classes of mineral substances, and you approach it pretty much in the same light as a blindfolded ambassador led by the hand through the fortifications of a besieged city. Such a process may be useful to the practical mineralogist who has studied no Chemistry, and who cannot be said even to have studied Mineralogy, but you do not find in it that which should ever be the guiding star of the teacher of youth—the formation of the mind.

Chemistry is absent from the theoretical part. The principle of crystallization is expounded in such a manner as to leave the student under the impression that only natural minerals crystallize. As for the laws regulating chemical composition, they are not mentioned; nor can it be alleged that the student is supposed to have studied them before, as no allusion is ever made to that anterior knowledge. On the contrary, the mechanical manipulation necessary for the most simple experiments with acids is given in detail, but not a word written to point out the chemical reaction which takes place. In the Descriptive the same exclusiveness is maintained in all but the grouping of the mineral species. The iron ores, copper minerals, silica, are put together, but not one of the numerous tests indicated by Chemistry to detect the presence of iron, copper, or that ubiquitous silica, is

ever referred to. Again, certain actions of a particular species with the blow-pipe, fluxes and acids, are enumerated, but they are considered as being properties inherent to the mineral, like the cartilaginous, or bony skeleton of the fishes; whereas, they ought to be mentioned as an action purely artificial, but performed in order to reveal the composition of the mineral, the sole property which is really inherent to it.

But in the books treating of Determinative Mineralogy the defect becomes shocking to everyone who regards mineralogy, not as a mechanic's trade, but as a real science, built on the most beautiful, and solid, and comprehensive principles. Principles! They have ceased to exist. You would think whilst studying descriptive mineralogy that chemistry, though much neglected, was however the basis of classification. You had seen collected in one group the minerals into which Iron enters as an element, in another group no species appeared but those that contained Calcium; but you now discover that you have been on the wrong track. All your mineralogical education has to be done over again. Pay no more attention to that chemical composition, or that crystalline form to which so much importance was attributed, at least speculatively, in the theoretical and descriptive parts. Now they vanish before external characters, and will appear again only at the very end, when all other characters will have failed to individualize the species. Fusibility is brought to the front; all minerals henceforth are divided into two classes according as they fuse with greater or less difficulty, or not at all. Be not surprised now to find together minerals which differ in every possible respect except that of fusibility. Are there two more different minerals than Bismuth and Magnetite? In composition one is the pure, well-known metal, the other the famous oxide of iron; in crystallization the former belongs to the rhombohedral system, the latter when crystallised exhibits the form of the Isometric. All their other properties are likewise at the antipodes of each other. Bismuth is exactly twice as heavy as Magnetite; its silver-white tinge contrasts strongly with the black colour of the magnetic ore; you scratch it with the finger nail, but your steel knife cannot affect the other; the one has a strong affinity for oxygen, which it absorbs rapidly under the action of heat, whilst the other, already saturated with oxygen, can only be reduced by the heat applied. I repeat again, can they be more

different? However, look in Brush, on p. 69; you will find them there united not only in the same class, or the same group, but, as it were, in the same family, standing side by side as closely allied species. For what reason? do you ask. Because both of them are fusible. Nor must you believe that they have the same degree of fusibility; far from it. Bismuth will fall in drops in the ordinary flame of a gas jet; but Magnetite, the strongest heat to be procured by the skillful management of the blow-pipe will scarcely round its thinnest edges. Another cause has brought these two minerals together, and nothing can illustrate better the scientific poverty of that system. Though Bismuth and Magnetite are two of the most easily characterized species, having very remarkable properties of their own, no group in the division of fusible minerals could be made to comprehend them, so they were left, and had to fall together under this scientific title, "Not belonging to the foregoing divisions." Of course, if we consider that Professor Brush intended his work for the use of those who are unacquainted with chemistry, we cannot throw any blame on him, nor slight the wonderful amount of erudition necessary to compile that work; for it is evident that the author had to be himself more than ordinarily conversant with the mysteries of chemistry to bring out those tests, so ingeniously contrived that even the uninitiated may, by their use, come to practical and sure conclusions. But it is no less true that the method is worse than useless to impart to the student that method of scientific research, more precious by far than all the skill he may acquire in determining particular minerals.

Some may deduce from the foregoing remarks that I am opposed to the study of Determinative Mineralogy in an elementary course. They are mistaken. On the contrary, they will presently see, when I propose my own system, what an important place I give to the determination of minerals. In fact, one of the greatest defects I find in the present system of most of the best books is the virtual exclusion of the determinative part of the science. For, as far as my humble experience reaches, I perceive that it is impossible to give to the students any taste for the rocky science till you put specimens into their hands to analyse.

I have been so long dwelling upon the actual system and showing its shortcomings that little time is left me now to expose the system

which I should like to introduce in its stead. But fortunately, the task will be simplified, since the same principles advocated during that long criticism must now guide us in the second part of this paper.

In my opinion, the student who intends studying Mineralogy should always follow first, at least, an elementary course of Chemistry. Theoretical Chemistry is the most necessary; next in importance comes the Descriptive, which gives him a notion of the various elements and their principal compounds; finally, if he has studied Analytical Chemistry, both qualitative and quantitative, he need not study Mineralogy—he may almost be said to know it. So, as I do not want to make my work too easy, I will suppose that he has studied very little Chemistry, or even none at all, though such a student must, of course, be a little deficient, and will never have a broad view of Mineralogy as a science.

The course should be divided into two parts: namely, Synthetical Mineralogy and Analytical Mineralogy. Here I must plead guilty to the introduction of new words into the vocabulary of the science. You must not be astonished; innovations must be very slight not to affect the language of a science, and I know of no other sufficiently comprehensive heading. But you will better judge this question by yourselves when I shall have explained the object of each of these divisions. In the Synthetical, the general principles of the science are laid down, uniting together the multiplicity of facts and details under the few laws which govern them. The Synthetical Mineralogy is itself subdivided into three parts, explaining what the crystallographic, chemical and physical properties of minerals are.

The chapter on Crystallography would be almost the same as is found now in the best text-books. I know that many students will be thankful to me for making no addition to that chapter. Yet its importance can never be too well appreciated.

The second chapter is devoted to Chemistry. The general principles of the science are laid down, but with constant reference to Mineralogy. All speculative considerations are thrown aside, whilst special attention is given to those laws which are well illustrated in the composition of minerals, chemical nomenclature, symbols and formulas, laws of combination, and especially the great law of equivalence. Stoichiometry would form the first part of the second chapter; whilst

the principles of chemical qualitative analysis in the dry and wet way would constitute the second and more practical part. The student that would deem this short study a fitting substitute for a regular course of Chemistry would be making a mistake, yet I think it sufficient for the purpose for which it is here intended. Besides, as you shall see hereafter, the whole of the second part of our course is a continued illustration of the principles expounded in this chapter, and I do not think that a student, after having followed the whole course of Mineralogy, thus construed, would have much trouble in becoming acquainted with Inorganic Chemistry.

The third chapter devoted to the physical characters, would not differ materially from what goes under that name in our text books.

I come now to the second part—Analytical Mineralogy—and this is by far the most difficult as well as the most important part of my work. First of all, you must not accept the word *Analytical* in the same sense as we say Analytical Chemistry: In that sense it would include only the determination of minerals. The word analytical is here spoken in opposition to the word synthetical, and does not mean the analysis of minerals, but the analysis of the science. Analytical Mineralogy is therefore the application of the principles of mineralogy to every particular case. In the first part, we have seen what are the general causes and laws which prevail throughout the mineral kingdom; in the second, we examine what effects nature has produced through their agency. In this sense it includes Descriptive Mineralogy, but it comprehends also the determinative study. Indeed you remember that I condemned the other systems for separating these two branches of the science. Therefore, my description of minerals must lead directly to their determination. It is very easily said, but I should prove myself very ignorant of the subject if I thought this re-union could be as easily performed. Far from believing it, I am really of the opinion that, by using only these characters which have hitherto had the exclusive right to be called mineralogical, the scheme must be thoroughly impracticable, and you cannot find this strange, knowing that the characters which are used now to determine minerals are not at all those which guide us in their classification. Consequently, the two series must remain perfectly independent.

But cannot this be remedied, not determination and description in every branch of Natural History in analogous studies ruled by the same laws and following the same description? Why should the method be otherwise in mineralogy? I know not, but I know that it is otherwise. The scientist who wishes to classify and describe a new mineral, always makes an analysis of it; but the mineralogist who afterwards meets that same mineral, tries to find the species to which it belongs just by the external characters and a few blowpipe tests which cannot suffice to find the species, since they were not deemed sufficient to constitute it.

Chemical composition, together with the crystalline form, is the basis of classification, therefore it ought to be also the ground for determination. But chemical composition cannot be ascertained without analysis, therefore a true chemical analysis must be the fundamental operation in determining minerals. All other observations and experiments are useful only in as much as they indicate either the composition of the mineral or the habit of the crystal.

Let us now apply this principle practically. You all know that in analytical chemistry substances are grouped according to the elements which they contain. These elements themselves are classed according to the solubility of their salts. A first series of tests leads you to one of the great classes of elements, the second points out, one by one, each of the elements that enter into the composition of the substance under examination. Now, I would distribute the different species of minerals according to the order in which a properly conducted chemical analysis would reveal them. This, of course, ought well to answer every case if we suppose in the student the time and ability for making a quantitative analysis; but such cannot ordinarily be the case, and the distinction must be maintained between the complete analysis of a mineral and its mere determination.

But when the qualitative analysis has restricted a specimen to a limited group, there is nothing to prevent us from using crystalline form and physical characters to reduce it to the last species. By so doing we re-establish the logical order which is inverted in the actual system. For it is an admitted principle that those properties which are most essential must be employed to determine the classes; less abso-

lute though important characters decide the groups and families; and lastly, slight external differences, if nothing better remains, serve to distinguish between closely allied species.

It is not necessary, in a general view, such as that taken in this paper, to give the details of the classification. But the outlines of the plan will convey you a clearer idea of what is new in the method.

Silicates are so numerous and play such an important part in the mineral kingdom that they may be said to constitute one sub-kingdom, all other minerals being relegated to form another. Thus we have the two fundamental divisions:—the Non-Silicates and the Silicates.

In the sub-kingdom of the Non-Silicates the classification is easy whatever system is adopted. We may either adopt the classification based upon the acidic element or the one which depends upon the basic or metallic constituent of the compound.

In any case we should have, in the beginning, a table containing the analytical tests which characterise, first, the great division of Silicates; secondly, each group of the Silicate or Non-Silicate sub-kingdom. At the head of each group, the characteristic reaction of each family would be given; and finally, the characters neglected till then would point out each single species which should now be completely described.

In the division of the Non-Silicates you perceive that in most cases the analytical test leads the student infallibly to the group and the family, and very often to the very species; leaving very little to the physical and crystalline character in the work of determination.

Among the Silicates, however, the difficulty is greater. The division into Hydrous and Anhydrous cannot well be effected in every case by analysis. Furthermore, the composition, so far as the quantity of each element is concerned, is extremely variable. Here, therefore, according to the plan we have adopted, we must follow, for the determination, the method which has served to constitute the species. Disregarding then, in the work of determination, those theoretical groups based on the similarity of chemical formulas, we may proceed with the help, firstly, of chemical analysis whenever it is practically available; secondly, the crystalline characters, including cleavage; thirdly, those physical properties which are more intimately connected

with the composition and crystalline form, specific gravity being foremost; fourthly, all the other accidents of hardness, lustre, color, &c, which, though illusory when employed in drawing the great lines of classification, become reliable means of deciding between three or four neighbouring species.

Such is the scheme which I venture to submit to your examination. I do not suppose it to be perfect in every respect, but to me it seems to avoid that great inconsistency of separating mineralogy from chemistry.

For me, this is not a mere speculative notion, but an idea which I have already begun to carry practically into effect in the course of mineralogy which I have the honor to teach in the university of our city. That idea has inspired me not only in the direction of my personal studies and in my method of teaching, but even in the material dispositions of the new chemical and mineralogical laboratory which will be opened next year to the students of the university, and I hope also to many of you gentlemen who have encouraged me, by your very flattering attention, to read to the end this dry and voluminous essay.

OTTAWA DRAGON-FLIES.

T. J. Maclaughlin.

Read 4th March, 1886.

To give anything like an accurate description of the dragon-flies, as a whole, would be rather a difficult task, and is, perhaps, more than it would be advisable to attempt at the beginning of my remarks; but before proceeding further it may be well to give a general idea of the predominant or characteristic features of the family to which they belong.

The head is generally large, in some species globular, with very large eyes often encircling the head; thorax large and square; abdomen always long, slender, cylindrical, burnished, brassy green and of various other colors; four membraneous, net veined wings, generally transparent, but often spotted and clouded, and in some cases almost entirely black, always expanded; legs long and delicate, evidently not intended for much walking.

Not long ago the Order Neuroptera was divided into two sections as follows (according to Erichson):

Section 1.—Pseudo, (or false) Neuroptera, Mandibulate insects with incomplete metamorphoses (active pupa); lower lip mostly cleft; four membraneous reticulate "wings (rarely with rudimentary wings or "apterous), antennæ either subulate, and then the tarsi three—to four "—articulate, or setiform, or filiform, in which case the tarsi are two—"to four—articulate."

Section II.—True Neuroptera.

Mandibulate insects with complete metamorphoses (inactive pupa); lower lip entire; four membranaceous, more or less reticulate wings (rarely with rudimentary wings or apterous); antennæ, setiform, filiform, clavate, capitate or pectinate; tarsi five-articulate.

These sections, however, are now considered by Entomologists as entirely distinct Orders.

Pseudoneuroptera is composed of six families; Termitidæ, Embidæ, Psocidæ, Perlidæ, Ephemeridæ and Libellulidæ. To this last family

belong all our dragon-flies, and it is divided into three tribes: Agrionina, Æschnina and Libellulina. Many of the genera are not represented in my collection, and indeed some of them are unrepresented in Canada so far as I can learn. I will not here mention all the sub-divisions of these groups—it would only be confusing—but I will notice our species as they occur in my collection.

The tribe Agrionina embraces all the smaller forms and some of the most beautiful species of the Odonata, which sub-order embraces, and is co-extensive with, the family Libellulidæ. The following description of this tribe is taken from Dr. Hagen's synopsis of the Neuroptera of North America:—"Antennæ four jointed; eyes distant; wings equal; "abdomen cylindrical, slender; accessory genital organs with the "anterior hook connate; penis and vesicle separated; genital organs of "the female vaginate."

The first sub-family is Calopteryginæ, the peculiarities of which are that the wings are densely reticulated, broad at, or toward, the apex or tip and very narrow at the base, with many anteanbital veins and the plerostigma wanting in the males.

Calopteryx Maculata, Beauvois, is a very pretty insect; the upper part of the head, with the thorax and abdomen, are of a bright green or blue colour, while the under portion of the same and the legs are black. The wings, in the case of the male, are entirely dark brown, closely approaching a black, except a small portion of the base of the hind ones which is semi-transparent. The length of the body is about $1\frac{7}{8}$ inches; expansion of the wings $2\frac{3}{8}$ inches.

Calopteryx aequabilis, Say.—This insect answers to the same description as the preceeding one, except that, instead of being black, the wings are hyaline or transparent, with a broad dark band on the apex of each, which gives it a beautiful appearance when flying in the sunlight.

Calopteryx virginica, Drury.—Although not so attractive as either of those mentioned this is still a very interesting species. The wings are narrower and of greater expansion, smoked or yellowish in colour with a semi-hyaline cloud on the tips and the pterostigma is milk white.

From their erratic course, the color and comparatively slow motion of their wings, and their habit of alighting on plants, branches

and stones every few yards they go, one not acquainted with these insects, would, without close observation, be apt to mistake them for butterflies, but when they are at rest at a reasonable distance the most casual observer would readily discern the difference. These insects frequent, and it may be said inhabit, swift running streams, especially, I think, those streams that flow through shaded places and woods. In open stretches and glades along such running waters those pretty little creatures are most likely to be found. They are not particularly rare in this vicinity but may be considered as quite local. The only place at which I have observed them is along a brooklet on the north side of the Aylmer road, which winds thro' low lands, meadows and woods from the direction of the Chelsea Hills and falls into the Ottawa River somewhere in the neighborhood of Hull.

I had been on the lookout for a representative of this genus for a whole summer without success, and not knowing the nature of their habitat, my desire to meet one of them would probably still be unsatisfied had it not happened that I accompanied Mr. Fletcher to the little creek mentioned, and there in all their lovely simplicity, fluttering about in their wonted listless fashion along the murmuring brooklet, shaded by long grass and overhanging willows, I first gazed on these little denizons of the stream. Nor did they seem the least alarmed at the approach of intruders, but continued to enjoy the silence of their secluded haunt which was only broken by the rustle of the leaves overhead and the musical babble of the waters as they rode over the shining pebbles beneath them. On this occasion we had very little trouble in securing several good specimens of each of the species named.

Sub-Family II.—Agrioninæ. The flies of this sub-family resemble those of Calopteryginæ in the general shape of the head and body, but the venation of the wings is very different, for instead of having many antecubital transverse veins they have only two. The wings also are petiolated in shape, *i. e.*, narrowed into a stem-like neck at the base, and always transparent without spots or clouds. The species are nearly always much smaller than those described, and instead of inhabiting swift running waters, most of them seem to have a decided preference for standing pools or sluggish streams. They vary in size

from an inch to an inch and three quarters in length, according to the species, and some are perhaps smaller than this.

Of the genus Lestes, I have just two species; *L. unguiculata*, Hag., and *L. eurina*, Say. The latter is an addition to the Canadian list not having been recorded before. These insects are so closely allied to those of the following genus, Agrion—the only distinctions being a slight difference in the length of the abdomen which is in favour of Lestes, and some difference in the form and venation of the wings—that my remarks on the Agrions as regards size, habits and general aspect will apply equally to them.

Agrion putridum, Hag; *A. pollutum*, Hag; *A. durum*, Hag; *A. civile*, Hag, and *A. iners*, Hag. are the smallest insects of the Odonata. They are much alike in habits and features, and where one of these five is found there also may the rest be looked for. During the fore-part of June they begin to issue from the pupæ cases, and from this date to the middle of September may be seen along the edges of creeks and small rivers, but in greater numbers where the water is standing and impure. Patterson's Creek, or that part of it between Bank street road and Elgin street, seems to be their favourite locality about Ottawa. They are very numerous here amongst the bulrushes and tall grasses which grow by the edge and in the shallow water. Upon the submerged stems and leaves of such plants they are said to deposit their eggs. I have never seen any of the agrions in what I could be sure was the act of oviposition, but I have often noticed them submerge a portion of the abdomen in the water, whether this was for the purpose of depositing eggs I know not, but I am of the opinion that no oviposition took place on any of the occasions of which I speak, as this performance was only of momentary duration. I have no doubt, however, that the eggs of these insects are committed to the water in some such manner, and perhaps the practice that I have so often observed, of dipping the abdomen into the water, was preparatory to the act of laying eggs. I have seen the statement somewhere that a certain species—*Agrion civile* I think it was—goes below the surface of the water several inches to deposit her eggs. It well repays one to remain quiet for a few minutes to watch and note the slow, noiseless and graceful movements of these little objects, a thousand of which might float

through the air about one's ears and not a sound be heard to indicate their presence. In addition to their fragility and innocent appearance some of them are arrayed in the most exquisite and gorgeous colours, and though the wings are plain and transparent, the absence of beauty in this respect, as compared with some others of their kind, is more than made up by the distinct, varied and brilliant colours of the rest of their bodies. They show their affections for each other in the most delicate and impassionate manner; the male, with the little forceps at the extremity of his abdomen, clasps the female gently about the neck and in this way they start off on their hymeneal wanderings, in the same slow and careless manner which characterizes their movements when flying alone. After death these insects lose their brilliancy and some of the colours disapear altogether, so that dried specimens in the cabinet show to very poor advantage compared with their appearance when alive and in a natural state. On this account it would be well for the collector, who is able to do so, to make a careful drawing of the fly at the time of capture and paint in the different shades in order to study it afterwards.

Agrion Hageni, Walsh.—This is a somewhat larger species, and does not confine its peregrinations to so small an area as some others of the genus do. Keeping well on wing, it approaches more closely, in point of appetite and disposition, to the larger insects of the other tribes. The upper surface of the thorax is powdery, but the rest of the body and wings present little diversity from the others.

Agrion violaceum, Hag., is of a violet colour, nearly as large as *A. Hageni*, and very energetic, but not so strong, and is more gentle in its manners.

Tribe II.—Æschnina.—Hagen's description of this tribe, as differing from the others, is as follows:—"Wings unequal; triangles of all "the wings of the same form; genital organs of the male having the "hamule connate; the penis and vesicle conjoined; genital organs of "the female vaginated or exposed."

Sub-family III.—Gomphinæ.—Eyes distant; posterior wings broader than the anterior ones.

Gomphus exilis, Selys.—A specimen of this species was taken in Dow's swamp, two or three miles to the southward of the city; and notwithstanding that I have seen many in and about that locality, I

have not observed one elsewhere. Is the swamp its habitat? It is a plain-looking insect; the markings of the body are dusky and inelegant; the wings are wholly transparent, with twelve antecubitals and nine postcubitals; length, about 2 inches; alar expanse, about $2\frac{1}{2}$ inches.

Gomphus vastus, Walsh, is a larger species. Length of body, $2\frac{1}{4}$ inches; alar expanse, $2\frac{3}{4}$ inches. The abdomen is very stout at the base, very slender in the middle, and the last three segments are enlarged into a sort of knob, The wings have fourteen antecubitals and thirteen postcubitals. I obtained a specimen of this species from Mr. Fletcher, who informs me that myriads of the same kind were to be seen a few years ago, flying about the Parliament buildings. I have never to my knowledge seen one living. It is a very singular fact that certain species of insects may abound in vast numbers one summer and not appear again, or be very rare, in the same part of the country for years afterwards.

Æschna.—The members of this genus are the most formidable looking of our "darning-needles." Their heads are unusually large, eyes are connected from near the labrum or upper lip to the upper part of the head and cover both sides down to the jaws or mandibles. The latter are exceptionally large and powerful, and the thorax is of immense proportions. The first few segments, or base of the abdomen, are small and pedunculate, while the rest of the member is long, slender and the same size throughout; the wings are broad and strong and lack the beautiful paintings which embellish those of the libellulidæ and others. The slenderness and length of the abdomen bear such a striking contrast to the enormous size of the other parts that these insects appear to be of the most anomalous structure.

Æschna heros, Fab.—Measures about $3\frac{1}{8}$ inches in length and a little more if the appendages are included. The wings expand about 4 inches, and have 21 to 25 antecubitals and 13 to 16 postcubitals. If the dragon-flies have fallen into ill-repute—and I think they have with some—their disgrace may well be attributed to this monster, and his brothers *Æ. verticalis*, Hag. and *Æ. vinosa*, Say, although neither is so large, may be counted in and considered as accomplices in the career of carnage and murder which has caused the degradation of the race. So far I have spoken of the beauty of the dragon-flies in terms

of admiration, but the splendid metallic colours which go to adorn and beautify insects of ordinary modesty are apt, in these species, to be completely lost sight of in considering their ferocity and bloodthirsty nature. But in looking at these horrible creatures (as some consider them) more deliberately we find they are not so bad after all, for it is in the satisfying of the demands of their voracious appetite that the object of their existence is carried out and their benefits conferred upon man. Were it not for the untiring wing and vigilant eye of these insects, many other noxious and troublesome forms would have things too much their own way. On the alert from morning to night they wage a continuous warfare against the mosquito and other small flies, and even moths and butterflies, with their bodies distended with eggs, on their way to some suitable place of deposit, are overtaken in the lightning course of the large dragon-flies, pulled down, torn to pieces and their soft parts devoured, and thus the embryonic forms of thousands of baneful caterpillars, so injurious to vegetation, are consumed in a few mouthfuls.

The three species I have mentioned are very common in these parts and may be seen almost anywhere you go, between the first of June and the first of October, and even later in the season, flying over the water, through the woods and fields, along the roadsides, in gardens, and according to some accounts often get into kitchens, in which case they soon become "Monarchs of all they survey." They often visit unoccupied grounds near dwellings, between sunset and dusk. I have frequently watched them measure off, as it were, about 100 feet square, then, keeping well within these bounds, proceed to investigate every foot of it until dark, then put up for the night on the fence or on the side or roof of the nearest building. *Æ. verticalis* is about $2\frac{3}{4}$ inches in length; alar expanse $3\frac{3}{4}$ inches—eighteen anticubitals; fourteen postcubitals. *Æ. vinosa* is a little longer; alar expanse $3\frac{7}{8}$ inches—twenty anticubitals; sixteen postcubitals.

Tribe III.—Libellulina. The prettiest of all the large dragon-flies are included in this division. I have noticed that writers describing the Odonata invariably select one of the Libellulæ as a typical species of the whole family, and from this standpoint proceed to depict them in every other than a flattering manner; this I consider is not fair, not

only to the first tribe, which I have considered so beautiful and innocent, but also to those of the tribe to which the insect thus selected belongs, as they are thus made to bear more discredit than they really merit. These insects are not nearly so ugly looking nor so voracious as those of Æschnina which I have tried to justly saddle with all the dishonour and uglyness said to be due to the dragon-fly collectively. The wings of nearly all the Libellulinæ, as previously stated, are beautifully marked with clouds of various hues, and the different species can be distinguished at once from those of Æschnina which some of them almost equal in size—by the abdomen alone, which instead of being long and slender and capable of being coiled up like those of the last mentioned, is comparatively short, stout at the base and gradually tapers off to the end. The segments are all joined together closely, and when the insect moves the abdomen—which it can do to a very limited extent up and down—the whole mass moves upon the first segment like that of a butterfly, which it may be said to resemble, except that it is not covered with scales, is a little longer and more depressed or flattened.

Epithica princeps, Hag.—is a large species with broad wings; there is a large triangular basal spot on the posterior or hind wings, a streak on the base of the front ones, and a small spot near the middle of each. This is not at all a common insect in this vicinity. I obtained a specimen of this species from Mr. Fletcher, who collected it at Billings' Bridge. The wings have eight antecubitals, five postcubitals, and expand $3\frac{1}{2}$ inches.

Cordulia lateralis, Burm. —is rather a common species here, in early spring, though apparently very rare in the Province of Quebec. The Rev. Abbé Provancher, an admirable authority in nearly all branches of entomology, and the only good one, I believe, in Canada on the neuroptera, to whom I am indebted for determining many of the insects in my collection—informs me that he had met with this species but once before he saw my specimen, and that was at St. Hyacinthe, P. Q. The anterior wings are narrow— the posterior ones broad with a small triangular basal spot. Length, $1\frac{3}{4}$ inches; alar expanse, $2\frac{3}{8}$ inches; seven antecubitals, six postcubitals.

Plathemus trimaculata, DeGeer, has three dusky brown spots on each wing; the abdomen is brown with yellow spots on either side.

Length, $1\frac{3}{4}$ inches ; alar expanse, $2\frac{5}{8}$ inches. Twelve antecubitals ; ten postcubitals.

Libellula quadrimaculata, Linn.—This is one of the first dragon-flies to make its appearance in Spring, and is rather common from May to July, but I have not seen many after the latter month. The wings have four brownish spots each, and are otherwise beautifully varigated with yellow stripes. Length, $1\frac{3}{4}$ inches ; alar expanse, $2\frac{7}{8}$ inches ; seventeen antecubitals ; ten to twelve postcubitals.

Libellula pulchella, Say, is a large insect and is rather plentiful all summer ; the wings are truly ornamental, each one having three brown spots which are surrounded by white clouds that glisten like glass. To see a number of these insects sporting over a pond, as they often do, is one of the prettiest sights in nature. Length, $2\frac{1}{4}$ inches ; alar expanse, $3\frac{1}{2}$ inches ; eighteen antecubitals ; twelve to fifteen postcubitals.

Libellula basalis, Say.—This, in my estimation, is the prettiest of its genus, and is seldom met with about Ottawa. I have only one specimen, but I got a glimpse of another last summer in Stewart's bush, but could not secure it. The large basal clouds are fuscous or nearly black, and are very clearly defined. The apical portion is so transparent and fine in texture, that nothing can be seen of the wings when the insect is in flight, but the basal clouds—on this account I took the first one I saw for a black butterfly. Length, $1\frac{3}{4}$ inches ; alar expanse, $3\frac{1}{4}$ inches ; sixteen antecubitals ; fourteen postcubitals. There is a narrow brown stripe all along the upper part of the abdomen and the sides are speckled.

Diplax.—The insects of this genus are the smallest of the Libellulidæ. They vary in length from about $1\frac{1}{8}$ to $1\frac{1}{2}$ inches. The wings expand from $1\frac{3}{4}$ to $2\frac{1}{2}$ inches, and have from seven to eight anticubitals, and six to eight postcubitals.

Diplax rubicundula, Say, is the red dragon-fly that is so common during the whole summer. The body is of a dull red, and the wings in the males are sometimes faintly tinted with the same colour. The female is of a dusky yellow, her wings are hyaline and extremely delicate. They are fond of grain fields—especially buckwheat when in blossom—where they congregate in thousands, and they probably do a

great amount of good in devouring insects injurious to the different crops. This is a question worthy of investigation by our Dominion Entomologist if he has not already examined it.

Diplax Scotica, Don., is less common, though not rare; it seems to be a hardy species. I caught one in Stewarton on the first of November, when the weather was so cold that no other insects were to be seen, at least flying about. The wings are plain and the body black.

Diplax Hudsonica, Selys, is much the same as *D. Scotia*. The abdomen, however, is not of the same shape, and has a yellowish spot on the fifth segment; besides, it has a very conspicuous white mouth.

Diplax costifera, Uhler.—Abbé Provancher says this is the first one of this species he has ever seen. I am not positive whether I got it at Casselman, on the Canada Atlantic Railway, or at Stewarton, but am under the impression it was at the latter place, in a meadow near Patterson's creek. I visited the same locality frequently during the past summer for the purpose of securing another, but could not see one. The specimen I have is so mutilated that it is impossible to ascertain whether it is a male or a female. It somewhat resembles the female of *Diplax rubicundula*, except that there is a yellow line on the anterior margin of each wing, extending from the pterostigma to the base.

Diplax semicincta, Say, is also rather rare around Ottawa. I captured one at Casselman, on the line of the C. A. Ry., summer before last, and I saw another the same year, in the vicinity of Hull, but did not secure it, and have not seen one since. Mr. Fletcher captnred a pair of this species on the Aylmer road, on the 20th Aug. last. It is smaller than any of the Diplax described, and the basal half of the wings is clouded a sort of rust colour.

I have now mentioned all of the insects of the Odonata in my collection, but a few more are still in Abbé Provancher's possession awaiting determination. As very little attention has been given to this family, it is safe to say that many more of the species mentioned from Quebec, and perhaps others not included in the Abbé's list, will be found here; and perhaps, some altogether new to science. It would, at least, be reasonable to expect this, in view of the many discoveries entirely new to science made by Mr. Harrington and Mr. Guignard in connec-

tion with the Hymenoptera, which order is now receiving their attention. Some of the members of the club having signified their intention of working up the Neuroptera during the ensuing summer, we may look forward to a much greater exhibit in this interesting branch of Entomology by the close of next collecting season.

Having viewed these creatures in their perfect state, we will now take a look at their early life. Dragon-flies are wholly aquatic animals, and are carnivorous in all the stages of their existence. The parent dragon-fly lays her eggs in the water, and her progeny, in their larval and pupa states, live beneath the water, and subsist upon other aquatic forms of animal life—largely upon the larvæ of the mosquito. The young of some species, after extension from the eggs, look like small spiders, so long are their legs compared with the diminutive size of their bodies.

I tried to rear some of the larvæ of Diplax and Agrion in aquaria last winter, for the purpose of gaining some knowledge of their early habits, but I do not know whether it was for want of knowledge of their proper treatment, or because of too much care, that they did not do well; at any rate, they died off shortly after confinement. Those of Diplax never seemed possessed of much vitality, and would not stir unless when touched, and then but very little. But the Agrions were all active and of a remarkably sportive turn, continually swimming up to the surface of the water, and when this point was reached they would suspend all muscular exertion and sink slowly to the bottom, often two or three lying across each other.

They would sometimes nibble at small pieces of meat which I offered them, but notwithstanding that I changed the water often and gave them all the other care I thought necessary, they grew weaker every day, discontinued their accustomed exercises, and finally passed quietly away, one after another, in the course of ten or twelve days after capture. I placed a few other Agrions in a separate vessel and put with them a bunch of lemna and moss in which I had found them imbedded in the water. I did not change the water in this bottle, nor did I give them any other attention, and left them in a cooler and darker place. This seemed better treatment than the other, for although these insects refused to eat anything, they survived the others three or four weeks.

The pupæ of the dragon-fly are only distinguishable from the larvæ by having wing-pads on the back; both being equally active. When the pupæ are ready for transformation they crawl out of the water upon the stems and branches of plants, secure a firm hold and remain until the sun dries the skin, which splits on the back, and the perfect insect comes forth, and leaves the hull clinging to the plant. Many of these old hulls or pupæ-cases may be seen sticking firmly to reeds and grasses along the edges of ponds, etc. After coming from this case a very short time is required to expand and dry the wings and otherwise prepare the insect for its ærial home, then away goes this beautiful creature with gauzy wings of gaudy colours, which, but a few moments before was a horrible, repulsive and voracious object, crawling over the slimy bottom of a filthy pool of stagnant water.

These insects have a remarkable weapon which enables them to capture their prey in their larval and pupa states, with as much ease as they afterward can upon the wing. The lower-lip is very long and shaped like a ladle, the end terminating with two incurved hooks. When the animal is at rest this elongation of the lip is folded up and concealed beneath the under jaw until some luckless insect comes within striking distance when out slips this trap-like apparatus (against which its victim has made no provision) and secures the booty.

With regard to their manner of breathing, Duncan in his work on the "Transformations of Insects" says: "The larvæ and nymphs "although living under water and must respire, have no branched or "external organs by which they can breathe. Their method of respi- "ration is unique; they breathe with their intestines. The large "intestine is covered with numerous tracheæ, and when the animal "wishes to breathe, it opens the orifice of the intestine and admits a "quantity of water. This of course contains air mechanically "suspended which is taken up by the tracheæ just mentioned." In expelling the water thus taken into the intestine it is sent out with considerable force which propels the animal forward with a jerk several times the length of its own body, and by this means it keeps out of the way of its enemies.

Dragon-flies always attract, more or less, the attention of everyone, and often excite curiosity in many who take but little notice of

insects generally. Some people notice them in order to avoid them on account of the mistaken impression which seems to prevail as to the poisonous effect of their sting, or on account of the childish tradition as to their habit of sewing up the eyes and then stinging their victim to death; while others admire them for their beautiful colours, slender forms and graceful motions. They are known by various names and epithets, such as:—Devil's darning needles, Mosquito Hawks, Horse-stingers, and some others in English. The Germans call them Wasser-jung-fern, or Virgins of the water. The Indians know them by the name of Kow-ne-she, or Duch-kow-ne-she, and the French are pleased to style them Damoiselles. This last does not seem so appropriate as some of the other appellations, as the point in which any of these creatures resembles a lady is not clearly defined—unless it is in their slender waists. I know that some of the large ants are also called Damoiselles by the French, and their delicate forms rather suggest the name; but with all their admiration for the beauty and modesty of women, I agree with Duncan when he says:—"No Frenchman would "think of comparing a dragon-fly to a lady if the nature of this animal "was known."

Avoided and despised as the dragon-flies are by many, I need scarcely say in conclusion that they are the most harmless things in creation—utterly incapable of injuring man or beast, but on the contrary, are highly beneficial in every form and in every stage of their life.

It is much to be regretted that the minds of children are often wrongly impressed by the telling of fabulous tales, and otherwise, regarding many objects of nature, which proves a stumbling block in the way of truth and science in after years.

If children were taken to the fields and to the woods at the earliest possible time, when the young mind is blank, so to speak, and susceptible of every impression, whether for right or wrong, and taught to observe and love the surrounding objects of nature; to avoid these things which ought to be avoided, but at the same time to admire and respect them; to know that a portion of the economy of the universe is laid out for each and every creature, and in order that its appointed task may be fulfilled with the greatest ease, each one is given the form and features peculiar to itself and most adapted to its calling; that the innumerable

works of creation all harmonize together for the one good purpose of humanity, and that therefore everything employed by nature, from the smallest to the greatest, irrespective of its appearance or the duties it has to perform, is worthy of man's greatest respect, his study and his intellect. By pursuing such a course in the early education of our children, we would be doing as much, I think, for the advancement of the natural sciences as we could otherwise hope to do.

REPORT OF THE GEOLOGICAL BRANCH.

Palæontology and Stratigraphy.

To the Council of the Ottawa Field Naturalists' Club.

The undersigned Leaders of the Geological Branch have much pleasure in presenting you with their report, (on palæontology and stratigraphy) and beg leave to state that as years go by there is a marked increase in the interest taken in geological work about Ottawa —a field so rich and varied for the lovers of that attractive science.

During the season that is just passed, the leaders appointed by your council have availed themselves of every opportunity possible to further the ends which the club has in view, and have performed the duties entrusted to them with the utmost diligence. As many sub-excursions as practicable were held, especially in the latter part of the season, and in various directions about the city, so that quite a number of new facts were gathered and most of the formations exposed in the neighbourhood visited. No less than *fourteen* excursions and sub-excursions were held, and the attendance at these far surpassed that of any previous season in the history of the club.

As in former reports of this nature it is deemed advisable to classify the results obtained under the respective formations to which they belong, so that should a general report or synopsis of the geology of Ottawa ever be compiled, the material at the disposal of the writer

will be in a more accessible and systematic form than it would otherwise be.

Whilst, during the past season, older formations than the Chazy have been visited, it is not deemed expedient as yet to publish the notes recorded, hence this report will begin with the

CHAZY FORMATION.—This Cambro-Silurian or Ordovician formation, so extensively developed in the Ottawa Valley, and from which only a very limited number of organic forms have as yet been obtained, will in any careful and attentive examination of the various series of strata which comprise its measures amply repay the observer. In the report for 1883-84 reference is made to the lower measures of this formation, which were observed on the occasion of the Club's excursion to Lake Deschenes. The exposures referred to along the north shore of the Ottawa River at that place, and between it and the railway track, were pointed out as being almost destitute of fossils, that the only fossiliferous rocks observed consisted of a band of ferruginous and rusty weathering sandstone, two or three inches in thickness—some four feet above low water mark. From this a number of characteristic fossils of the Chazy formation had been collected. (Trans. O.F.N.C., vol. I, No. 4, p. 64.)

During the past season, Mr. W. E. T. Sowter has traced this same band in its westerly extension to the town of Aylmer, four miles from Deschenes Village, whilst the occurrence of the same band between these two localities has also been ascertained by the same gentleman. At the wharf in Aylmer this characteristic band may be seen about a foot and a-half above the lake level.

This affords, therefore, a good criterion from which to ascertain the precise horizon of the measures at Aylmer and wherever its occurrence may be signalled. A brachiopod—*Orthis imperator*, Billings—is the most abundant and most easily recognised form, so that on account of its prevalence this band will in future be referred to as marking the zone of Orthis imperator.

There is a small *Rhynchonella* associated with the above species. It has few plications or costæ but they are comparatively large and angular, much like *R. orientalis*, Billings, described from the Mingan Islands. The forms under consideration agree very well with Hall's description and

figures *Rhynchonella plena*, or as he called it: *Atrypa plena*. These fossils along with other species are obtained as casts of the interior of the shell, &c., and are imbedded in and composed of a coarse matrix, consisting of rounded grains of quartz cemented together by a calcareous mass of a light gray colour. This band has, no doubt, a much greater geographical distribution than has as yet been assigned to it, for south, west and north of the wharf the same measures are seen along the Ottawa, on both sides of the river almost up to the Chats Falls. This discovery of Mr. Sowter's is interesting and throws additional light on the lower measures of the Chazy formation, any of which is most welcome.

At Britannia, opposite Deschenes, on the Ontario side of the Ottawa River, the club held one of its regular monthly excursions on the 19th of September last. There the same formation is again seen to crop out between the track (C.P.R.) and the river and the lake shore, as also south of the track, between it and the Richmond Road. A number of sections were taken, and the calcareous nature of many strata noted, but little was found in the way of fossils until late in the day.

From the thin bedded renaceous beds of the Chazy formation here (lower series) we are pleased to record the discovery of beautiful scolithoid markings. It was Miss Wyndham who had the honour of discovering the same, and in great abundance, in a field a few hundred yards to the south west of the present station or railway crossing. The question arose as to whether or not the presence of this *Scolithus* did not indicate that these rocks were of the Potsdam formation. Against this view was the fact, brought up by one of the leaders, that similar markings of annelids (?) doubtfully referable to *S. Canadensis*, Billings, but difficult to differentiate, had been found by him in exposures of the Chazy at Hog's Back, Nepean, between the zone of *Lingula Belli* and the "Leperditia band" higher up in the section. Then the fact that there is no evidence whatever of a fault or dislocation occurring here between Britannia and Deschenes, coupled with the horizontality of the measures throughout, makes it clear that the Chazy of Deschenes occurs also at Britannia. Thus, from the palæontologic as well as from the statigraphic argument the evidence is entirely for the Chazy formation.

These peculiar remains of organisms—worm-like burrows—referable to Haldeman's genus *Scolithus* occur in great abundance and differ in respect but little from Billing's *S. Canadensis*. On the whole the burrows might be described as much less flexuous, less wide, rather crowded and straightened than those of *S. Canadensis*, but scarcely can it be recognised as a new species, so great is the range of variation in the specimens examined.

Chartland's Island in Lake Deschenes—the property of Mr. C. M. Church—was noticed by Mr. Sowter to consist of limestones which for the most part exhibit the peculiar concentric patches resembling *Stromatocerium* of Hall, and is therefore of Chazy age.

Black River Formation. This formation which immediately and conformably overlies the Chazy formation has been further noticed by Mr. Sowter to be developed on the property of Mr. Neil about one mile north of the town of Aylmer, at which place the typical coral *Tetradium fibratum*, Safford, was collected by him during the past season, and indicates with great exactness that the rocks from which it came belong to this formation. A sub excursion of the club was held at the Petite Chaudière, on the Ottawa River, a favourite resort of the late Mr. E. Billings, and amongst the characteristic fossils of that formation which were collected and noted, on that day Mr. Whiteaves obtained a Cyrtoceras, probably the *C. regulare* of Billings.

Trenton Formation.—In this formation some interesting and new facts have to be placed on record. At the sub-excursion held Saturday, October 24th, in the vicinity of McKay's Bay, where the members present had an oportunity of examining a geological *fault* and upturned strata, no less than twenty-six species of fossils were collected. Prof. Macoun obtained a fine rolled up example of *Calymene senaria*, Conrad. Mr. Ami collected in addition to other interesting forms two glabellæ of *Remopleurides Canadensis*, Billings. This species described by Mr. Billings in his "Palæozoic Fossils," vol. I, p. 182, from the Chazy formation in the front concession of the township of Clarence, on the Ottawa River, had never before been found in strata so high up in the series. This together with *Remopleurides striatulus*, Walcott, were the only two species of that genus known so high up and both of the Trenton formation. Associated with this addition to

our list of Trenton forms were found numerous specimens of *Beyrichia*, *Pholidops* and also *Orthis insculpta*, *O. pectinella* and *O. occidentalis*. *Rhynchonella recurvirostra*, Hall, oftimes referred to as a *Zygospira*, but recently placed under the new genus *Anazyga* of the late lamented Dr. Davidson, was found in very great abundance. *Dalmanites Bebryx* of Billings was also found here.

The form referred to by Mr. Ami in his "List of the Cambro-Silurian fossils of Ottawa, etc.," 1884, as *Tetradium Peachii, var Canadense*, Foord, with a query (?) has since been thoroughly worked up and examined with great accuracy by Prof. W. B. Dwight of Vassar College, Ponghkeepsie, N. Y. In the course of this very interesting study, Mr. Ami had ample opportunity for nearly two years (since the spring of 1883) of seeing the whole process of elucidation, as it was developed in that well defined and eminently interesting organism. After careful examination it was definitely ascertained that the species in question was unmistakably that which Mr. E. Billings had described as *Stromatopora compacta* (Pal. Foss. Vol. I, p. 55) and the same which Sir William Dawson very appropriately placed provisionally in the genus *Chætetes*. During his visit to Europe last fall, Mr. Ami made it a point to consult Dr. Dybowski's work on "*Die Chætetiden*," etc, where that Russian author had described a form, *Solenopora spongioides* of undoubted affinity and intimate likeness to Billings' *Stromatopora compacta*. They were, no doubt, both referable to one species and one specific designation. It was then a question which had the priority, Billings', Dybowski's, Nicholson and Etheridge's or Mr. Foord's. Mr. Billings' name was prior by several years, and therefore his specific reference will stand whilst the others fall to the ground. The genus *Solenopora*, however, which Dr. Dybowski had at the same time created to receive his species *S. spongioides* will certainly stand and be accepted as the recognised genus to which Billings' species must be referred. This form then will be known as *Solenopora compacta*, Billings. The greatest difficulty which had arisen was regarding the existence of tabulæ proper. Some authors found the tabulæ to be absent altogether (Dybowski and Foord), others very numerous (Dawson, Nicholson and Etheridge), but to Dr. W. B. Dwight is certainly due the credit of discovering them in the winter of 1884-5 in especially fine and well pre-

pared sections, some of which that gentleman very kindly presented to Mr. Ami.

Several sub-excursions were held at which the Trenton formation was examined, and at one of these, the excavations being carried on beside the Water Works office, a fine specimen of *Pleurocystites filitextus*, Billings, was obtained, and close to it a species of *Cyclocystoides*.

Utica Formation.—Early in the spring (1885) Mr. Ami had an opportunity of visiting the exposures of this formation in company with Prof. C. D. Walcott, Palæontologist to the Geological Survey of the United States, whose writings on the "*Utica*" are so well known that mere mention is necessary to associate the two. On this occasion, as usual, a large number of forms were found, so that Prof. Walcott was enabled to examine a number of species regarding which it was desirable to obtain his opinion. For instance, the graptolite described by himself under the name of *Graptolithus annectans*—a form most probably referable to the genus *Leptograptus*—was collected and recognised by him. The brachiopod at times referred to *Orthis testudinaria*, Dalman, and again to some other species, proved to be *Zygospira modesta*, Say.

A Pholidops was also collected here, and numerous specimens of *Triarthrus spinosus*, Billings, with three spines on the posterior thoracic segments, together with *T. Becki*, Greene, adult and young, and other species.

Siphonotreta Scotica, Davidson, is a form which was described by Mr. Whiteaves as occurring in this formation, but nothing further was known than that the specimens had been collected from rocks of supposed Utica age about the property of Mr. J. W. H. Watts, loose, or from some excavation in the neighbourhood. Having ascertained the association of species and the lithological character of the rock in which the species was found, Mr. Ami proceeded in company with Mr. Fred Hayter, an active worker in geology, to the Gloucester side of the Little Rapids, near the rifle range, on the Rideau river, as the rocks of that locality bore a strong resemblance to those holding the *Siphonotretæ* collected up to date. The first band examined was that holding the *Conularia* in abundance; a bed of impure limestone teeming with remains of this pteropod and brachiopods belonging to the genera Zygospira, Orthis and Leptena. *Discina Pelopea* was also found here, but no trace of

Siphonotreta Scotica was seen in this bed, which averages about an inch in thickness. The bed immediately underlying this band—the zone of *Conularia Trentonensis*, Hall—was then examined, and it was not long before several fine individuals were found of the form referred to Dr. Davidson's species. This bed is some twelve inches in thickness, and consists of a dark, somewhat bituminous, impure limestone, holding *Siphonotreta Scotica*, Davidson; *Lingula elongata*, Hall; *Asaphus Canadensis*, Chapman; *Calymene senaria*, Conrad; *Leptæna sericea*, Sowerby, etc.

As will be seen by comparing the lists of fossils already published by the club, *Lingula elongata* and *Discina Pelopea*, are both forms new to the Utica formation, and to the lower portion or oldest measures the same.

Post-Tertiary.—Owing to the activity on the part of our worthy City Engineer, Mr. Robert Surtees, C. E., and our civic authorities, in carrying on extensive sewage and other works, the student of Geology has had a great many openings and sections exposed in the Post Tertiary strata of Ottawa. On Rideau and Cumberland streets interesting sections were obtained in some places to a depth of sixteen feet. The following is one of the sections taken on Cumberland street, corner Daly avenue:—

No. 1.	Light yellow sand.....	2 ft.	0 in.
2.	Small rounded pebbles and sand.....	0	4
3.	Yellowish grey sand.....	10	0
4.	Bluish grey sands (fossiliferous).....	2	0
5.	Stiff blue clay "	2 to 3	0
		16 ft. 4 in. to 17 ft. 4 in.	

In Nos. 1, 2 and 3 no fossils were found, but in 4 and 5 the following species occurred:—

In No. 4 .....
(a) *Notica affinis*, Gmelin.
(b) *Saxicava rugosa*, Linnæus.
(c) *Portlandia arctica*, Gray.

In No. 5 .....
(a) *Saxicava rugosa*, Linnæus.
(b) *Portlandia arctica*, Gray.

These shells are all of marine origin, and belong to the two classes of Gasteropoda and Lamellibranchiata. They belong to species still existing in our Canadian waters, in the Gulf of St. Lawrence, along the Atlantic coast, also in Greenland and Norway, and in other parts of the world. One of them, *Saxicava rugosa*, L., is even found on the Pacific slope, both living and fossil (Dr.G. M. Dawson). *Macoma calcaria*, Chemnitz, was also found in the Cumberland-street excavation in stratum No. 5, at a subsequent time. This species and *Notica affinis*, Gmelin, are new to the list of Post Tertiary forms published by the club (1884).

In conclusion, the Leaders beg leave to solicit the co-operation of as many of the members interested in geology as possible in collecting the material necessary to frame up a systematic work on the Geology of Ottawa. It may take years and years of labour; every little helps Facts are what we need at present, and when a good topographical map of the district has been published, it will be easier to lay down the geological boundaries than at present.

The increased attendance at the sub-excursions is very encouraging and most gratifying to the leaders, and they sincerely hope that the manifest interest taken in geological matters during the past season will be kept up in years to come.

HENRY M. AMI,
W. E. T. SOWTER,
Leaders.

29th January, 1886.

REPORT OF THE CONCHOLOGICAL BRANCH.

To the Council of the Ottawa Field Naturalists Club:

In presenting the report of the Conchological Branch, we have to say, with regret, that but little work has been done in this department during the past year. The absence from Ottawa, during the greater part of the summer, of one of the leaders of this branch, and the business engagements of the other, may lead you to regard with indulgence our seeming neglect of duty. We have not, however, been altogether remiss in fulfilling our obligations. To act in concert with other members of the Club was, in many cases, impracticable; but whenever the occasion presented itself for individual work, it was eagerly made use of.

On the 17th May, near the High Rock Apatite Mines, on the River Lievre, a variety of the common white lipped snail, *Mesodon albolabris* var. *dentata*, was found which is of considerable interest, as throwing light on an anomolous and hitherto unsatisfactorily explained record of "Helix exoleta Binney," from the valley of the neighboring river, the Rouge (D'Urban, Can. Nat. & Geol., 1860, p. 81). In a paper read before the club on the 7th February, 1885, this record was doubted, and it was suggested, as the only explanation which seemed possible, that D'Urban's shell was really *M. Dentiferus*. Quite recently it was noticed by one of the leaders of this branch that Mr. Whiteaves had expressed the same doubt and made the same suggestion in the *Canadian Naturalist* for 1863. No toothed mesodons but *sayii* and *dentiferus* were known to occur in eastern Canada; and as *M. sayii* was enumerated in the list of shells collected in the Rouge valley, *M. dentiferus* seemed the only shell which could have been taken for *M. exoletus*. There remained, however, the difficulty of explaining how Mr. Binney, who identified D'Urban's shells, could confound species which differ so widely as *M. exoletus* and *M. dentiferus*. But the dentate variety of *M. albolabris* might readily be taken for *M. exoletus*. The occurrence of this well marked variety at the High Rock Mines thus clears up a doubtful though, perhaps, not very important, point in Canadian Natural History.

It is of interest from another point of view, as it extends the range of the *var. dentata* very materially. It occurs in Michigan, from which

fine specimens are now in the possession of one of the leaders of this branch. Dr. Binney writes that he is unaware of it being found east of the Alleghany Mountains of Pennsylvania. Among hundreds of specimens of *M. albolabris* collected in the vicinity of this city and of Toronto, not a toothed shell has been noticed. If by "Mesodon albolabris var. dentifera, Binney," recorded in Trans. No. 5, p. 81, from the marl beds at Hemlock Lake, is meant var. *dentata*, then this variety was not long since to be found near Ottawa, as the shell marl is entirely fluviatile in its origin, and all land shells found in it are recent.

A second addition to the lists previously published has been made in the rare and beautiful *Sphaerium rosaceum, Prime.* This was found on the muddy shores of the eastern end of McGoey's Lake, in the Laurentides, near Chelsea. Had time permitted a great many specimens might be obtained from this most fruitful collecting ground. Large and fine examples of *Sphaerium sulcatum* were also found in the same locality, which affords, in addition, the beautiful *Physa Lordi* and *Limnæa megasoma.*

On the Club excursion to Britannia a number of shells were collected, but, so far as we are aware, they do not call for any particular observations.

F. R. LATCHFORD,
P. S. POIRIER,
Leaders.

4th March, 1886.

REPORT OF THE ENTOMOLOGICAL BRANCH.

To the Council of the Ottawa Field Naturalists' Club:

During the past season considerable activity has been displayed by the members of the club connected with this branch.

Owing to the character of the weather, during the summer months, being exceptionally cold and wet, insects, generally, were less abundant than in the two preceding years. However, not a few rare species were captured, and many additions were made to the lists in the different orders. Some of these prizes, it may be added, were captured by collectors who had only taken up the study of entomology last spring. It is thus shown that valuable results may attend even the earliest efforts of any student. We are glad to welcome, as having attached themselves to this branch, some of the younger members of the club, and we trust that they will continue to prosecute the study of our local insects with the same energy as has been displayed by them this year.

The sub-excursions, which have been so successful this season, were well attended and afforded frequent opportunities for the entomologists to meet each other, and mutually profit by the exchange of ideas and comparison of observations. At these excursions also several of the best captures of the year were secured.

Attention must be drawn to a few items of general interest to this branch. Of great importance to Canadian naturalists is the fact that the Abbé Provancher, one of the corresponding members of the club, has been able to resume the publication of his useful magazine, *Le Naturaliste Canadien*, which has appeared in an enlarged form, and of which several parts have already been issued. Of special interest to the members of this branch is the recent purchase by the Government of the magnificent entomological collection of Captain Geddes, of Toronto. This is now being arranged for exhibition in the museum of the Geological and Natural History Survey, where the cabinets will soon be available for examination and reference.

The adoption of the electric light, as a means of illuminating the city, has been attended with interesting results to entomologists.

Several species, hitherto considered rare, have been collected at these lights, to which insects of all kinds are attracted in large numbers.

HYMENOPTERA.—Large collections were made in this order during the season, and so many species have now been secured that the publication of a local list will soon be advisable; this, however, cannot be accomplished until a number of species collected in this locality by Mr. Harrington and Mr. Guignard, which are entirely new to science, have been described. These are now, with this object, in the hands of the Abbé Provancher, an eminent authority, who has already commenced the publication of additions to the Canadian list. Particular attention may be drawn to a few species. A curious representative of the ant family belonging to the genus amblyopone, hitherto unknown in America and only recorded from tropical regions, is represented by two specimens in the collection of Mr. Harrington. Mr. Guignard has been fortunate enough to collect specimens of a bee for which even a new genus must be created, and this step has also been found necessary for some other of the new species.

LEPIDOPTERA.—In this attractive order a considerable amount of work has been done, both in collecting and in breeding from the egg. It will be seen by the programme that a paper on the Diurnal Lepidoptera is to be read later in the winter, in which all items of interest regarding these forms will be recorded. Butterflies and moths of all kinds were remarkably scarce during the whole summer, with the sole exception of *Danais Archippus*, or "Milk-weed Butterfly," which seemed to take the place in numbers of *Pyrameis Cardui*, "The Thistle Butterfly," or "Painted Lady," which swarmed the year before, when, strangely enough, the Milk-weed Butterfly was very scarce. One of the most interesting observations made in this order during the season was an attack on the maples, and subsequently on the beech trees, in Beechwood, by the caterpillars of the small moth, *Incurvaria acerifoliella*, the "Maple leaf cutter." The larva forms for itself a flat case, in which it lives, of oval pieces cut from the maple leaves upon which it feeds. The trees for a space of several acres were severely attacked and the foliage had the appearance of having been blighted and turned brown. The case-bearing larvæ were to be seen in myriads in every direction, on the leaves, on the ground and on the stems of trees. The

moth from this species does not emerge until the following June, so that any one desiring to secure specimens will probably have no difficulty in doing so next year by visiting Beechwood in that month.

DIPTERA.—The study of this order in Canada is still exceedingly difficult, owing to the lack of works dealing with the classification and identification of species. This, however, will be gradually remedied, as several American entomologists are engaged in the work, and articles are appearing from time to time on various groups. Specimens have been taken by several of our collectors, and the species in their possession are now fairly numerous, although but few of them have been, as yet, identified.

COLEOPTERA.—Although this order has been well investigated in past years, it has been found possible to add quite a number of species to the extensive lists already existing, while additional specimens of some of the rarer species have been captured. Among these may be noticed *Xyloryctes satyrus*, a very large beetle belonging to the Scarabæidæ, of which a fine specimen was taken by Miss I. Grant, at a sub-excursion to Beechwood in September. A fine male of *Pityobius anguinus*, figured in Transactions No. 1 under its synonym *P. Billingsii*, was captured by Mr. Fletcher in his study one evening, it having been attracted by the lamp. *Pœcilinota cyanipes*, a beautiful Buprestian, was captured at a sub-excursion beyond Stewarton, on a poplar stump. *Hydrophilus triangularis*, one of our largest water beetles, not before captured by our members, was received from Mr. A. L. Jarvis, who found it beneath an electric light. As soon as the species which remain to be identified have been determined, a supplementary list will be prepared for publication.

HEMIPTERA.—This order has not yet received much attention, but as synoptic tables are now being published in Entomologica Americana, and as Abbé Provancher is publishing descriptions of all Canadian species, it will be possible for collectors to work at it advantageously. The number of species known from this locality is, however, nearly 100.

NEUROPTERA.—Mr. T. J. Maclaughlin has made extensive collections in this order and part of his work will be submitted to the Club later, in the shape of a paper on the dragon-flies of this locality.

JAMES FLETCHER,
T. J. MACLAUGHLIN,
Leaders.

10th December, 1886.

REPORT OF THE ORNITHOLOGICAL BRANCH FOR THE YEAR 1885-86.

To the Council of the Ottawa Field-Naturalists' Club:

Although we cannot make as brilliant a showing in the present report as we did in that for last year, yet much valuable work has been accomplished, especially in the noting of the times of arrival and departure of an increased number of species. Only four new species have been added to our local list, as against nine added last year; still this may be taken to bear witness rather to the thoroughness of the work during former years than to any lack of it during the year just past. Yet, there must, unquestionably, remain a large number of species still undiscovered, the presence of which it must be the duty of local Ornithologists in coming seasons to detect and record.

The following are the four newly recorded species above referred to. The numbers refer to the new A. O. U. Check List, from which the nomenclature is taken:

47. *Larus marinus.* Great Black-Backed Gull. One individual of this gull was seen on May 2nd, 1885, near Kettle Island, on the Ottawa, in company with ten or twelve herring gulls.

70. *Sterna hirundo.* Common Tern. A male bird of this species was shot near the St. Louis Dam on June 29th, 1885.

238. *Tringa maritima.* Purple Sandpiper. Shot on the bank of the Rideau River on October 29th, 1885, by Mr. W. Forbes.

646. *Helminthophila celata.* Orange-Crowned Warbler. A male bird of this warbler was obtained near the eastern end of the city on September 27th, 1885, by Master Ted. White.

The following are among the more important captures made during the year:

60. *Larus philadelphia.* Bonaparte's Gull. Specimens of this gull were obtained on June 9th and September 17th, 1885.

135. *Anas strepera.* Gadwall. A female of this species, rare with us, was shot on the Ottawa, from a small flock, October 29th.

202. *Nycticorax nycticorax nævius.* Black-crowned Night Heron. A specimen obtainod on October 2nd.

239. *Tringa maculata.* Pectoral Sandpiper. September 20th.

243. *Tringa alpina pacifica.* Red-backed Sandpiper, October 2nd.

347. *Archibuteo lagopus sancti-johannis.* American Rough-legged Hawk. November 12th.

463. *Empidonax flaviventris.* Yellow-bellied Flycatcher. May 25th.

626. *Vireo philadelphicus.* Philadelphia Vireo. August 27th.

629. *Vireo solitarius.* Blue-headed Vireo. September 13th.

650. *Dendroica tigrina.* Cape May Warbler. June 7th.

660. *Dendroica castanea.* Bay-breasted Warbler. These warblers appeared rather commoner than usual last spring.

671. *Dendroica vigorsii.* Pine Warbler. August 27th.

675. *Seiurus nove-boracensis.* Water-Thrush. May 11th.

726. *Certhia familiaris americana.* Brown Creeper. There have been two more winter records of this bird, viz., February 18th and December 5th, 1885.

On the 2nd of May last Master Ted White shot a very peculiarly marked Robin. The back was ash or light gray and there were light gray markings on the tail, the latter making the bird appear as if it had a dead leaf lying on its tail.

The present winter (1885-86) has been remarkable for the scarcity of winter birds. With the exception of a number of Red Cross-bills and a few Great Northern Shrikes, none of our familiar winter visitors from the North have been noted; while Crows have been unusually abundant, having been about every day or two since the beginning of the winter. The Purple Finch (*Carpodacus purpureus*) is a new addition to the list of our winter birds, one having been shot on 29th December last. The late Dr. Vancourtland, many years ago, recorded the bird as occurring in January; but the record has hitherto been considered by us to be questionable.

Spring birds, with the dates on which they were first seen in the spring of 1885:

March 8—*Corvus americanus*, Crow, bulk arrived (a few, however, were seen from time to time during the winter.)
" 9—*Octocorus alpestris*, Horned Lark.
April 1—*Molothrus ater*, Cowbird.
" 2—*Carpodacus purpureus*, Purple Finch.
" 6—*Botaurus lentiginosus*, American Bittern.
" 7—*Merula migratoria*, Robin.

April 7—*Ardea herodias*, Great Blue Heron.
" 8—*Quiscalus quiscula æneus*, Bronzed Grackle.
" 9—*Larus argentatus smithsonianus*, Herring Gull.
" 11—*Melospiza fasciata*, Song Sparrow.
" 11—*Junco hyemalis*, Junco.
" 11—*Spinus tristis*, American Goldfinch.
" 11—*Poœcætes gramineus*, Vesper Sparrow.
" 11—*Ammodramus sandwichensis savana*, Savanna Sparrow.
" 11—*Zonotrichia albicollis*, White-throated Sparrow.
" 11—*Sialia sialis*, Bluebird.
" 11—*Tachycineta bicolor*, Tree Swallows.
" 11—*Falco sparverius*, American Sparrow Hawk.
" 12—*Agelæus phœniceus*, Red-winged Blackbird.
" 17—*Scolecophagus carolinus*, Rusty Blackbird.
" 17—*Sayornis phœbe*, Phœbe.
" 17—*Clivicola riparia*, Bank Swallows.
" 18—*Accipiter velox*, Sharp-shinned Hawk.
" 18—*Accipiter cooperi*, Cooper's Hawk.
" 19—*Sturnella magna*, Meadow Lark.
" 19—*Turdus fuscescens*, Wilson's Thrush.
" 19—*Turdus aonalaschkæ pallasii*, Hermit Thrush.
" 20—*Regulus satrapa*, Golden-crowned Kinglet.
" 20—*Passerella iliaca*, Fox Sparrow.
" 20—*Spizella monticola*, Tree Sparrow (first).
" 20—*Ceryle alcyon*, Belted Kingfisher.
" 21—*Chelidon erythrogoaster*, Barn Swallow.
" 21—*Sphyrapicus varius*, Yellow-belled Sapsucker.
" 21—*Colaptes auratus*, Flicker.
" 22—*Anas obscura*, Black Duck.
" 22—*Cyanocitta cristata*, Blue Jay.
" 22—*Spizella socialis*, Chipping Sparrow.
" 22—*Habia ludoviciana*, Rose-breasted Grosbeak.
" 22—*Piranga erythromelas*, Scarlet Tanager.
" 22—*Progne subis*, Purple Martin.
" 23—*Lophodytes cucullatus*, Hooded Merganser.
" 23—*Gallinago delicata*, Wilson's Snipe.
" 23—*Actitis macularius*, Spotted Sandpiper.
" 23—*Falco columbarius*, Pigeon Hawk.
" 23—*Pandion haliaëtus carolinensis*, American Osprey.
" 23—*Regulus calendula*, Ruby-crowned Wren.
" 25—*Aix sponsa*, Wood Duck.
" 25—*Buteo latissimus*, Broad-winged Hawk.
" 25—*Myiarchus crinitus*, Crested Fly-catcher.
" 26—*Zonotrichia leucophrys*, White-crowned Sparrow.
" 26—*Troglodytes ædon*, House Wren.
" 27—*Charitonetta albeola*, Buffle-head.
" 28—*Spizella monticola*, Tree Sparrow (abundant).

May 2—*Spizella monticola* Tree Sparrow (last seen).
" 4—*Merganser americanus*, American Merganser.
" 4—*Dendroica virens*, Black-throated Green Warbler.
" 5—*Colymbus auritus*, Horned Grebe.
" 5—*Colymbus holbœllii*, Holbœll's Grebe.
" 6—*Chætura pelasgica*, Chimney Swift.
" 6—*Petrochelidon lunifrons*, Cliff Swallow.
" 6—*Clivicola riparia*, Bank Swallow.
" 6—*Dendroica coronata*, Myrtle Warbler.
" 7—*Mniotilta varia*, Black and White Warbler.
" 7—*Dendroica cœrulecens*, Black-throated Blue Warbler.
" 7—*Compsothlypis americana*, Parula Warbler.
" 7—*Dendroica vigorsii*, Pine Warbler.
" 7—*Setophaga ruticilla*, American Redstart.
" 7—*Sylvania pusilla*, Wilson's Warbler.
" 8—*Dendroica blackburniæ*, Blackburnian Warbler.
" 8—*Zonotrichia leucophrys*, White-crowned Sparrow (last).
" 9—*Geothlypis trichas*, Maryland Yellow-throat.
" 9—*Totanus melanoleucus*, Greater Yellow-legs.
" 9—*Totanus flavipes*, Yellow-legs.
" 10—*Ectopistes migratorius*, Passenger Pigeon.
" 10—*Galeoscoptes carolinensis*, Catbird.
" 10—*Turdus mustelinus*, Wood Thrush.
" 11—*Anas discors*, Blue-winged Teal.
" 11—*Porzana carolina*, Sora.
" 11—*Seiurus noveboracensis*, Water Thrush.
" 12—*Dendroica maculosa*, Magnolia Warbler.
" 13—*Dendroica æstiva*, Yellow Warbler.
" 13—*Dolichonyx oryzivorus*, Bobolink.
" 13—*Tyrannus tyrannus*, Kingbird.
" 14—*Empidonax minimus*, Least Fly-catcher.
" 14—*Icterus galbula*, Baltimore Oriole.
" 14—*Harporhynchus rufus*, Brown Thrasher.
" 16—*Vireo olivaceus*, Red-eyed Vireo.
" 17—*Seiurus aurocapillus*, Oven-bird.
" 18—*Sylvania pusilla*, Wilson's Warbler (last).
" 19—*Oidemia deglandi*, White-winged Scoter.
" 19—*Clangula hyemalis*, Old Squaw.
" 19—*Vireo solitarius*, Blue-headed Vireo.
" 19—*Dendroica castanea*, Bay-breasted Warbler.
" 19—*Tringa minutilla*, Least Sand-piper.
" 20—*Vireo gilvus*, Warbling Vireo.
" 20—*Antrosomus vociferus*, Whip-poor-will.
" 20—*Chordeiles virginianus*, Nighthawk.
" 20—*Melanerpes erythrocephalus*, Red-headed Woodpecker.
" 21—*Dendroica coronata*, Myrtle Warbler (last.)
" 21—*Sylvania canadensis*, Canadian Warbler.

May 22—*Agelaius phœniceus*, Red-winged Blackbird.
" 22—*Coccyzus erythrophthalmus*, Black-billed Cuckoo.
" 22—*Dendroica pensylvanica*, Chestnut-sided Warbler.
" 22—*Ampelis cedrorum*, Cedar Waxwing.
" 24—*Ægialitis vocifera*, Killdeer.
" 25—*Trochilus colubris*, Ruby-throated Hummingbird.
" 25—*Empidonax flaviventris*, Yellow-bellied Flycatcher.
June 7—*Sterna hirundo*, Common Tern.
" 7—*Dendroica tigrina*, Cape May Warbler.

The summer birds were last seen in 1885 on the following dates :—

August 25—*Progne subis*, Purple Martin.
" 25—*Petrochelidon lunifrons*, Cliff Swallow.
" 26—*Trochilus colubris*, Ruby-throated Hummingbird.
" 27—*Dendroica maculosa*, Magnolia Warbler.
" 27—*Vireo philadelphicus*, Philadelphia Vireo.
" 27—*Seiurus aurocapillus*, Ovenbird.
" 28—*Colaptes auratus*, Flicker.
" 29—*Dendroica blackburniæ*, Blackburnian Warbler.
" 29—*Tyrannus tyrannus*, Kingbird.
" 29—*Chelidon erythrogaster*, Barn Swallow.
" 29—*Clivicola riparia*, Bank Swallow.
" 29—*Sphyrapicus varius*, Yellow-bellied Sapsucker.
September 5—*Chætura pelasgica*, Chimney Swift.
" 9—*Sylvania canadensis*, Canadian Warbler.
" 10—*Setophaga ruticilla*, American Redstart.
" 10—*Dendroica castanea*, Bay-breasted Warbler.
" 10—*Dendroica æstiva*, Yellow Warbler.
" 10—*Dendroica virens*, Black-throated Green Warbler.
" 12—*Dendroica pensylvanica*, Chestnut-sided Warbler.
" 12—*Mniotilta varia*, Black and White Warbler.
" 12—*Coccyzus erythrophthalmus*, Black-billed Cuckoo.
" 12—*Melanerpes erythrocephalus*, Red-headed Woodpecker.
" 12—*Chordeiles virginianus*, Nighthawk.
" 13—*Vireo solitarius*, Blue-headed Vireo.
" 13—*Dendroica vigorsii*, Pine Warbler.
" 13—*Geothlypis trichas*, Maryland Yellow-throat.
" 13—*Galeoscoptes carolinensis*, Catbird.
" 13—*Harporhynchus rufus*, Brown Thrasher.
" 15—*Sylvania pusilla*, Wilson's Warbler.
" 16—*Icterus galbula*, Baltimore Oriole.
" 16—*Sayornis phœbe*, Phœbe.
" 17—*Larus philadelphia*, Bonaparte's Gull.
" 20—*Gallinago delicata*, Wilson's Snipe.
" 24—*Piranga erythromelas*, Scarlet Tanager.
" 24—*Dendroica striata*, Black-poll Warbler.
" 27—*Helminthophila celata*, Orange-crowned Warbler.

Sept'mb'r 29—*Scolecophagus carolinus*, Rusty Grackle.
" 29—*Dendroica palmarum*, Palm Warbler.
" 29—*Aegialitis semipalmata*, Semipalmated Plover.
October 2—*Tringa alpina pacifica*, Red-backed Sandpiper.
" 2—*Actitis macularia*, Spotted Sandpiper.
" 2—*Nycticorax nycticorax nœvius*, Black-crowned Night Heron
" 8—*Quiscalus quiscala æneus*, Bronzed Grackle.
" 9—*Troglodytes aëdon*, House Wren.
" 11—*Melospiza georgiana*, Swamp Sparrow.
" 12—*Sturnella magna*, Meadowlark.
" 12—*Troglodytes hiemalis*, Winter Wren.
" 12—*Turdus fuscescens*, Wilson's Thrush.
" 13—*Accipiter atricapillus*, American Goshawk.
" 14—*Vireo olivaceus*, Red-eyed Vireo.
" 16—*Compsothlypis americana*, Parula Warbler.
" 17—*Buteo lineatus*, Red-shouldered Hawk.
" 17—*Falco columbarius*, Pigeon Hawk.
" 17—*Spizella socialis*, Chipping Sparrow.
" 17—*Anthus pensilvanicus*, American Pipit.
" 19—*Zonotrichia albicollis*, White-throated Sparrow.
" 19—*Ammodramus sandwichensis savanna*, Savanna Sparrow.
" 21—*Anas discors*, Blue-winged Teal,
" 21—*Erismatura rubida*, Ruddy Duck.
" 21—*Fulica americana*, American Coot.
" 22—*Dendroica caerulescens*, Black-throated Blue Warbler.
" 22—*Turdus aonalaschkæ pallasii*, Hermit Thrush.
" 23—*Ampelis cedrorum*, Cedar Waxwing.
" 23—*Philohela minor*, American Woodcock.
" 24—*Botaurus lentiginosus*, American Bittern.
" 25—*Regulus satrapa*, Golden-crested Kinglet.
" 26—*Anas carolinensis*, Green-winged Teal.
" 27—*Circus hudsonius*, Marsh Hawk.
" 27—*Passerella iliaca*, Fox Sparrow.
" 29—*Branta canadensis*, Canada Goose.
" 29—*Tringa maritima*, Purple Sandpiper.
" 29—*Tringa fuscicollis*, White-rumped Sandpiper.
" 30—*Corvus americanus*, American Crow (some, however, were seen from time to time all winter).
" 30—*Anas strepera*, Gadwall.
" 30—*Aix sponsa*, Wood Duck.
" 31—*Charadrius apricarius*, Golden Plover.
" 31—*Regulus calendula*, Ruby-crowned Kinglet.
November 1—*Ardea herodias*, Great Blue Heron.
" 3—*Gallinago delicata*, Winson's Snipe.
" 12—*Larus argentatus smithsonianus*, American Herring Gull.
" 12—*Oidemia perspicillata*, Surf Scoter.

Nov'mb'r 12—*Archibuteo lagopus sancti-johannis*, American Rough-legged Hawk (probably with us all winter).
" 12—*Ceophlœus pileatus*, Pileated Woodpecker (with us all winter).
" 15—*Totanus melanoleucus*, Greater Yellow leg.
" 15—*Junco hyemalis*, State-colored Junco.
" 24—*Merula migratoria*, American Robin.
" 26—*Merganser americanus*, American Merganser.
" 26—*Ceryle alcyon*, Belted Kingfisher.
" 26—*Melospiza fasciata*, Song Sparrow.
" 26—*Clangula hyemalis*, Old-Squaw.
December 5—*Certhia familiaris americana*, Brown Creeper (a few probably with us all winter).
" 12—*Accipiter velox*, Sharp-shinned Hawk.
" 28—*Spinus tristis*, American Goldfinch.
" 20—*Carpodacus purpureus*, Purple Finch.

The winter birds were first seen last fall (1885) on the following dates:—

August 26—*Loxia curvirostra minor*, American Crossbill.
October 31—*Plectrophenax nivalis*, Snowflake.
December 1—*Loxia curvirostra minor*, American Crossbill.
" 29—*Lanius borealis*, Northern Shrike.

W. L. SCOTT,
JOHN MACOUN.
GEO. R. WHITE,
Leaders.

18th February, 1886.

REPORT OF THE BOTANICAL BRANCH.

To the Council of the Ottawa Field Naturalists' Club:

The work in this branch has been continued on the plan of former years, the Saturday afternoon outings and the regular club excursions bringing the members together for systematic work and instruction. In the early summer the attendance on Saturday afternoon was augmented by the presence of a large number of pupils of the public schools under the care of Mr. Robert B. Whyte. They constituted a class which had been conducted by this gentleman during the winter, and he concluded his work by a series of demonstrations in the field.

Of the club excursions the most productive for the Botanists was the one to Casselman, where the greater number of the additions to the list were obtained.

A plant worthy of mention gathered in the district, but at too great a distance from Ottawa to be included in the local list, is *Cnicus altissimus*, Willd, var. *discolor*, which was found by Mr. Ami at St. Philippe, Que.

The plants added to our catalogue during the past season number 19, which indicates a continued activity and vigilance among the members. Those most worthy of notice are *Corallorhiza striata*, *Aplectrum hyemale*, and *Carex arcta*.

Hitherto our catalogue has included only flowering plants and ferns, although some of the workers have devoted their attention to cryptogamic botany. This year we are enabled to add a list of Mosses prepared by Professor Macoun. With the exception of a few species collected by Mr. Fletcher and indicated in the list, all were collected by the Professor himself, and all the specimens mentioned have been submitted to him for indentification. We trust it will facilitate the work of those who have already commenced, and that it will induce others to begin, this very attractive branch of Botany.

R. B. WHYTE.
JOHN MACOUN.
BEAUMONT SMALL, M.D.

Flora Ottawaensis.

Additions, 1885.

Ranunculus multifidus, Pursh var. repens, Watson, Gatineau Point, July —Prof. Macoum.

Viola cucullata Ait. var. cordata, Gr. McKay's wood, May—Prof. Macoun.

Solidago rugosa, Mill, common, August—Mr. Fletcher.

Aster Novæ-Angliæ, L. Casselman, August—Miss Nellie Macoun.

Aster Lindleyanus, T. & G. St. Louis Dam—Mr. Fletcher.

Lactuca leucophæa, Stewart's Bush—Mr. Fletcher.

Lophanthus nepetoides, Benth. Casselman, August—Mr. Fletcher.

Callitriche autumnalis, L. Brigham's Creek, August—Prof. Macoun.

Salix purpurea, L. Billings Bridge, May—Mr. J. M. Macoun.

Salix balsamifera, Barratt Patterson's Creek, May—Mr. J. M. Macoun.

Corallorhiza striata, Benth. New Edinburgh—Miss C. L. Hanington.

Aplectrum hyemale, Nutt., McKay's wood—Col. White.

Sparganium simplex, Huds. var. androcladum, Gray. Casselman, August —Prof. Macoun.

Juncus alpinus, Villars. var. insignis, Fries. Casselman, August—Prof. Macoun.

Juncus pelocarpus, E. Meyer, Britannia, September—Prof. Macoun.

Carex arcta, Boot, Gatineau Point, August—Prof. Macoun.

Carex pubescens, Muhl., Stewart's Bush, May—Mr. Fletcher.

Carex tentaculata, Muhl., Casselman, August—Prof. Macoun.

Carex trichocarpa, var. imberbis Gr.—Mr. R. B. Whyte.

LIST OF MOSSES COLLECTED IN THE NEIGHBORHOOD OF OTTAWA.

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

1. Sphagnum acutifolium, Ehrh.—Common in peat bogs.—Dow's swamp. Oct., 1884. Mer Bleue. Lake Flora.

2. Sphagnum Wulfianum, Girgens.—Peat bogs and cedar swamps.—Mer Bleue. (Fletcher).

3. Sphagnum cymbifolium, Ehrh.—Peat bogs and swamps.—Dow's swamp. Oct., 1884. Mer Bleue. Lake Flora.

4. Cynodontium virens, Schimp. var. Wahlenbergii—Rotten logs in thick damp woods—Woods near Ironsides; also at the mines on the River Lievre. May 19, 1885.

5. Dicranella varia, Schimp.—On damp earth along ditches. Ditch along the railway south of St. Louis Dam. May, 1885.

6. Dicranella heteromalla, Schimp.—On damp sandy banks and on turned up stumps in woods.—McKay's woods; also Skead's farm, Richmond Road. May 12, 1885.

7. Dicranum montanum, Hedw.—On the bases of trees and stumps. McKay's woods, without fruit; fruiting at the mines on the Lievre. May 19, 1885.

8. Dicranum viride, Schimp. On the bases of trees in woods. McKay's woods; also at the mines on theLievre. May 18, 1885. Always without fruit.

9. Dicranum flagellare, Hedw.—On rotten logs in woods.—Dow's swamp; Skead's farm, Richmond Road. May 9, 1885.

10. Dicranum fulvum, Hook.—On boulders in woods.—Woods at the phosphate mines on the Lievre. Rare. May 19, 1885.

11. Dicranum scoparium, Hedw.—On earth and old logs in woods. Common everywhere.

12. Dicranum Schraderi, Web. and Mohr.—Peat bogs and swamps. Dows' swamp. Oct., 1884.

13. Dicranum undulatum, Turn.—Logs and earth in damp woods. At the phosphate mines on the Lievre. May 19, 1885.

14. Dicranum spurium, Hedw.—On dry rocks and at the bases of trees in dry places. Rockcliffe. (Fletcher).

15. Fissidens bryoides, Hedw.—On earth on mounds in woods.—In woods west of Mr. J. Lorne McDougall's house, Hintonburgh. May 9, 1885.

16. Fissidens minutulus, Sulliv.—On stones and damp earth in the beds of dry water-courses.—McKay's woods and beyond the toll gate, by the C.P.R. crossing on the Aylmer Road. In fruit in October.

17. Fissidens osmundoides, Hedw.—Roots of trees in swamps. Dows' swamp; also in wet woods at Carleton Place. May 30, 1884.

18. Fissidens adiantoides, Hedw.—Roots of trees, old stumps and on stones in damp woods around Ottawa; common.

19. Leucobryum vulgare, Hampe.—On earth in damp woods.—Gilmour's Island, Chelsea, and at Lake Flora, Hull. (Fletcher).

20. Ceratodon purpureus, Brid.—Abundant on earth and rocks in woods and fields, or by roadsides, also on walls and roofs of houses; very common.

21. Seligeria pusilla, Bruch. and Schimp.—On the damp surface of limestone rocks, two miles from Hull; our smallest and rarest moss.

22. Barbula unguiculata, Hedw.—On earth along roadsides.—Common; abundant on Park Avenue (Oct., 1884) and at St. Louis Dam.

23. Barbula convoluta, Hedw.—On earth in pastures.—Carleton Place and in pastures west of Rochesterville (May, 1885).

24. Barbula tortuosa, Web. and Mohr.—On limestone rocks and ledges in woods.—Ironsides, west of Chelsea road (Oct., 1884); on rocks north of Hull (May, 1885).

25. Barbula ruralis, Hedw.—Dry rocks and sterile ground.—Nepean point (Oct., 1884) and ledges along the Ottawa; McKay's woods (May, 1885).

26. Leptotrichum tortile, Muell.—On earth along the roadside near Buckingham village; very rare. (May, 1885).

27. Didymodon rubellus, Bruch. and Schimp.—Crevices of rocks along streams.—West of Chelsea Road, Ironsides (Oct., 1884), and in woods north of Hull (May, 1885).

28. Grimmia apocarpa, Hedw.—Common on limestone and other boulders.—Rocks west of Hull (Oct., 1884), and near Hintonburgh (May, 1885).

29. Hedwigia ciliata, Ehrh.--Abundant on boulders everywhere. McKay's Lake (May, 1884). Hull. Billing's Bridge. Chelsea.

30. Hedwigia ciliata, Ehrh. var. viridis, Schimp.—On boulders in shady places.—Rockcliffe (Fletcher).

31. Orthotrichum anomalum, Hedw.—On limestone rocks in woods along the creek west of Hull (May, 1885); apparently rare.

32. Orthotrichum sordidum, Sulliv. and Lesq.—On trees, generally in wooded swamps.—In woods near Ironsides (October, 1884). Hintonburg (May, 1885). Rockcliffe, (1882.)

33. Orthotrichum Ohioense, Sulliv. and Lesq.—On trees in woods; McKay's Lake, May, 1885; Hull, P.Q. Rare.

34. Orthotrichum brachytrichum, Schimp.—On Ash trees generally; on trunks along the Chelsea road (October, 1884) and in woods, Skead's farm, Richmond road; McKay's woods (May, 1885).

35. Orthotrichum strangulatum, Beauv.—On trees and fences.—On trunks along the Chelsea road (October 1884); on trees, Skead's farm, Richmond road, and in McKay's woods (May, 1885).

36. Orthotrichum leiocarpum, Bruch. and Schimp.—On trees in swamps.—On Balsam and Spruce trees along the Chelsea road (October, 1884), also west of Skead's farm, Richmond road (May, 1885).

37. Encalypta ciliata, Hedw.—In crevices of rocks in ravines. On ledges along the creek west of Hull (October, 1884), also very abundant at Rockcliffe, at McKay's Lake, and along the Ottawa (May, 1885).

38. Tetraphis pellucida, Hedw.—On rotten stumps in damp woods.—Dow's swamp (October, 1884). South of Hintonburg, and at McKay's Lake (May, 1885).

39. Physcomitrium pyriforme, Brid.—On damp earth in exposed places.—Metcalfe street, Stewarton (Fletcher).

40. Funaria hygrometrica, Sibth.—On earth by old burnt log heaps, borders of woods. Common.

41. Bartramia Œderiana, Swartz.—Damp rocks in ravines. Hull (October, 1884), and at McKay's Lake and Rockcliffe (May, 1885).

42. Bartramia pomiformis, Hedw.—Crevices and faces of damp rocks in woods.—Ironsides; King's mountain; along the Aylmer road (October, 1884) and at McKay's Lake (May, 1885).

43. Philonotis fontana, Brid.—Along ditches and around springs. Bank of Rideau river, below the Hog's Back (Fletcher).

44. Leptobryum pyriforme, Schimp.—On earth in burnt swamps or wet woods.—Dow's swamp (October, 1884), also at McKay's Lake (May, 1885).

45. Bryum pendulum, Schimp.—On earth in woods and on wet rocks along streams.—Rockcliffe (Fletcher).

46. Bryum intermedium, Brid.—Crevices of damp rocks; on ledges in McKay's woods (May, 1885).

47. Bryum bimum, Schreb.—Wet swampy woods; common. Swamp in McKay's woods (May, 1885).

48. Bryum argenteum, Linn.—On earth and dry rocks, chiefly by roadsides, common. St. Louis' Dam (October, 1884)

49. Bryum cæspiticium, Linn.—On dry and exposed soil.—Rockcliffe (Fletcher).

50. Bryum roseum, Schreb.—On old logs in woods, rare in fruit. McKay's woods, and south of Hintonburg (May, 1885).

51. Mnium cuspidatum, Hedw.—Very abundant on damp earth and stones in woods. Common everywhere (May, 1885).

52. Mnium affine, Bland.—On earth in swamps and by brooks. Dow's swamp (October, 1884), also on logs by a pond at the phosphate mines, Lievre River, and at McKay's Lake (May, 1885).

53. Mnium lycopodioides, Schwaegr.—On the bases of trees in swamps and on damp rocks.—Dow's swamp (October, 1884), in woods at the phosphate mines, Lievre River, and at McKay's Lake (May, 1885).

54. Mnium stellare, Reichard.—On roots of trees in shady wet places.—Dow's swamp (October, 1884), also in swamps south of Hintonburgh (May, 1885).

55. Mnium punctatum, Hedw.—On earth in swamps; Dow's swamp (October, 1884).

56. Aulacomnion palustre, Schwaegr.—In swamps and wet woods. Dow's swamp (October, 1884).

57. Timmia megapolitana, Hedw.—On the roots of trees in swamps and on faces of damp rocks in ravines.—Dow's swamp (October, 1884), also along McKay's Lake (May, 1885).

58. Atrichum undulatum, Beauv.—On sandy hummocks in damp woods; McKay's woods (Oct., 1884), and in Skead's woods, Richmond Road (May, 1885).

59. Polytrichum juniperinum, Willd.—On the bases of stumps and in sandy fields; common in all suitable places.

60. Polytrichum piliferum, Schreb.—On barren ground, chiefly on rocks.—Gilmour's Island and King's Mountain, Chelsea, P.Q. (Fletcher).

61. Buxbaumia aphylla, Linn.—Upon exposed but damp rocks on the north side of Gilmour's Island, Chelsea (May 4, 1881); very rare. (Fletcher).

62. Fontinalis antipyretica, Linn.—On stones and sticks in streams.—In the stream running out of Fairy Lake, through the beaver meadow, Hull, P. Q. (Fletcher).

63. Dichelyma pallescens, Bruch. and Schimp.—On dead sticks in pools.—In pasture fields near St. Patrick's bridge, Ottawa; rare. (Oct., 1884).

64. Neckera pennata, Hedw.—On trunks in damp woods.—Quite common; McKay's Lake (May, 1885).

65. Homalia trichomanoides, Bruch. and Schimp.—On the bases of trees and on rocks in ravines.—On trees, Skead's farm, Richmond road, and on rocks, McKay's Lake. (May, 1884).

66. Leucodon sciuroides, Schwaegr.—On trunks of trees in woods.—McKay's woods, near the lake. (May, 1884).

67. Leucodon julaceus, Sulliv.—On trunks of trees in woods; rear of Skead's farm, Richmond road; Hull. (May, 1885).

68. Leskea nervosa Myrin.—On the bases of trees in woods. McKay's woods (Oct., 1884), and north of the Aylmer road, (May, 1885).

69. Anomodon rostratus, Schimp.—On the bases of trees and on rocks.—McKay's woods (Oct., 1884), and rear of Skead's farm, Richmond road, (May, 1884).

70. Anomodon apiculatus, Bruch. and Schimp.—On old stumps and decaying logs.—Rear of Skead's farm, Richmond road, (May, 1885).

71. Anomodon attenuatus, Hueben.—On rocks and at the bases of trees in swamps.—McKay's woods and Skead's farm. (May, 1884).

72. Anomodon obtusifolius, Bruch. and Schimp.—On trunks of trees in swamps and wet woods.—McKay's Lake, and in rear of Skead's farm, Richmond road, (May, 1885).

73. Anomodon viticulosus, Hook. and Taylor.—On damp rocks in large masses, especially on limestone.—Shaded rocks along the creek beyond the C. P. R. crossing, Hull, P.Q. (Oct., 1884).

74. Platygyrium repens, Bruch. and Schimp.—On old logs in woods; not uncommon.—Dow's swamp, (Oct., 1884), also Skead's and McKay's woods, (May, 1885).

75. Pylaisia polyantha, Bruch. and Schimp.—On trees, especially poplar.—McKay's woods; rare. (Oct., 1884).

76. Plyaisia intricata, Bruch. and Schimp.—On trees, logs and fences; common.—Very abundant on fences, Richmond road, (May, 1885), also at Ironsides, (Oct., 1884).

77. Pylaisia velutina, Bruch. and Schimp.—On trees and logs, apparently rare.—McKay's Lake, (May, 1885).

78. Cylindrothecium cladorrhizans, Schimp.—In woods on decaying logs; not common.—Rotten logs, McKay's Lake, and rear of Skead's farm. (May, 1885).

79. Climacium Americanum, Brid.—In wet woods or swamps on the ground or decaying logs, McKay's woods, (Oct., 1884), and in a swamp north of the Aylmer road (May, 1885); Powell's grove, near the creek; in fruit. (1879 Fletcher.)

80. Hypnum (Thuidium) minutulum, Hedw.—On old logs and stumps in swamps or wet woods.—Dow's swamp (Oct., 1884); at McKay's Lake, and north of the Aylmer road, beyond Hull. (Mar., 1885).

81. Hypnum (Thuidium) scitum, Beauv.—On the trunks of Beech trees, near the base. McKay's woods and at the phosphate mines on the Lievre river. (May, 1885).

82. Hypnum (Thuidium) gracile, Bruch. and Schimp.—On old logs in thick woods.—Dow's swamp (Oct., 1884), and McKay's woods and rear of Skead's farm (May, 1885).

83. Hypnum (Thuidium) recognitum, Hedw.—On earth in damp woods.—Dow's swamp (Oct., 1884), also in woods at the phosphate mines on the Lievre River, (May, 1885).

84. Hypnum (Thuidium) delicatulum, Linn.—On earth in swamps. Along the Chelsea road, near Ironsides, (May, 1885).

85. Hypnum (Thuidium) abietinum, Linn.—On dry exposed rocks; not common.—On ledges, along the creek north of Hull. (May, 1885).

86. Hypnum (Thuidium) Blandovii, Web. and Mohr.—Peat bogs and other swamps.—Dow's swamp. (Oct., 1884).

87. Hypnum (Campothecium) nitens, Schreb.—On earth, in peat and other swamps.—Dow's swamp. (Oct., 1884).

88. Hypnum (Brachythecium) lætum, Brid.—On old logs, stones and earth in woods; not uncommon.—Abundant on earth near McKay's Lake and in Skead's woods. (May, 1885).

89. Hypnum (Brachythecium) salebrosum, Hoffm.—On damper soil than the preceding; capsules larger and pedicel longer.—McKay's woods and rear of Skead's farm. (May, à885).

90. Hypnum (Brachythecium) œdipodium, Mitt.—On the bases of trees in swamps; very rare.—Dow's swamp. (Oct., 1884).

91. Hypnum (Brachythecium) rutabulum, Linn.—On stones and earth in shaded damp places. McKay's woods, near the lake. (May, 1884).

92. Hypnum (Brachythecium) rivulare, Bruch.—On stones and earth in swamps and around springs.—Swamp at St. Louis Dam, Ottawa. (Oct., 1884).

93. Hypnum (Eurhynchium) strigosum, Hoffm.—On earth and stones in woods.—McKay's woods, (Oct., 1884), and in woods along the Aylmer road, (May, 1885).

94. Hypnum (Eurhynchium) diversifolium, Schimp. Ms.—Shady banks in woods. McKay's woods (October, 1884).

95. Hypnum (Eurynchium) hians, Hedw.—Moist banks of brooks in shady woods.—Along a brook west of Mr. J. Lorne McDougall's house, Hintonburg, and in McKay's woods. (May, 1885).

96. Hypnum (Raphidostegium) recurvans, Schwaeger.—On bases of large trees in thick woods.—Abundant. (May, 1885).

97. Hypnum (Rhynchostegium) deplanatum, Schimp.—In thin mats on earth and stones. In the rear of Skead's farm and at McKay's Lake, (May, 1885).

98. Hypnum (Rhynchostegium) rusciforme, Weis.—On stones in rivers and brooks.—In a brook at the phosphate mines, Lievre river. (May 19, 1885).

99. Hypnum (Thamnium) Alleghaniense, Muell.—In crevices of rocks, damp ravines, limestone rocks.—McKay's Lake, May, 1885).

100. Hypnum (Plagiothecium) turfaceum, Lind.—On the top of old rotten stumps, and on logs in shady damp woods.—Dow's swamp (Oct., 1884). also on the banks of the creek west of Hull, and on stumps at McKay's Lake. (May, 1885).

101. Hypnum (Plagiothecium) denticulatum, Linn.—On old logs and hummocks in swamps.—Dow's swamp (October, 1884).

102. Hypnum (Plagiothecium) Sullivantiæ, Schimp.—In crevices of rocks and on shady banks in woods.—At the phosphate mines on the Lievre River and at McKay's Lake (May, 1885).

103. Hypnum (Plagiothecium) sylvaticum, Huds.—On shaded, steep rocks in woods and also on logs, near Ironsides, Chelsea road, and on rocks north of Hull (October, 1884), also on rocks McKay's Lake (May, 1885).

104. Hypnum (Amblystegium) confervoides, Brid.—In thin mats on flat limestone rocks.—On ledges in woods west of Mr. J. Lorne McDougall's house, Hintonburgh, also in same situation north of Hull (May, 1885).

105. Hypnum (Amblystegium) serpens, Linn.—On rotten wood, earth and stones, common.—Dow's swamp (October, 1884); frequent in McKay's woods (May, 1885).

106. Hypnum (Amblystegium) adnatum, Hedw.—On stones and at the base of trees in woods; McKay's woods (October, 1884).

107. Hypnum (Amblystegium) compactum, Muell.—On the bases of trees in swamps.—Carleton Place (May, 1884).

108. Hypnum (Amblystegium) riparium, Linn.—On sticks, stones and decayed logs in wet woods.—Wet places near St. Patrick's Bridge, Ottawa (October, 1884).

109. Hypnum (Campylium) hispidulum, Brid.—On stones and roots of trees.—Carleton Place (May, 1884), also in woods north of the Aylmer road and at McKay's Lake (May, 1885).

110. Hypnum (Campylium) chrysophyllum, Brid.—On the bases of trees and on steep rocks in ravines; in woods along the Chelsea road (October, 1884), in woods at the phosphate mines on the Lievre River (May, 1885), and at Rockcliffe.

111. Hypnum (Harpidium) aduncum, Hedw.—In swamps and marshes.—Dow's swamp (October, 1884).

112. Hypnum (Harpidium) Kneiffii, var. laxum, Mild.—In bogs and swamps.—Dow's swamp (October, 1884).

113. Hypnum (Harpidium) uncinathum, Hedw.—Quite common in swamps, ditches and bogs. Dow's swamp (October, 1884).

114. Hypnum (Rhytidium) rugosum, Linn.—On exposed rocks along rivers.—Rockcliffe (Fletcher).

115. Hypnum (Ctenium) crista-castrensis, L.—On old logs and earth in swamps.—Dow's swamp (October, 1884), also in thick woods north of Hull (May, 1885).

116. Hypnum reptile, Michx.—On bark and trunks of trees. McKay's woods and wood north of Hull (May, 1885).

117. Hypnum imponens, Hedw.—On decayed logs in shady woods.—Woods near Ironsides, Chelsea road (October, 1884); rear of Skead's farm and at McKay's lake (May, 1885).

118. Hypnum Haldanianum, Grev.—On decaying trunks and damp earth in woods.—Very common around Ottawa (October, 1884).

119. Hypnum (Calliergon) cordifolium, Hedw.—Cedar and other swamps.—Dow's swamp (October, 1884).

120. Hypnum (Calliergon) cuspidatum, Linn.—In cedar and other swamps.—Dow's swamp (October, 1884).

121. Hypnum (Pleurozium) splendens, Hedw.—On earth in cool woods and swamps.—Dow's swamp (October, 1884); Billing's Bridge and Hull, P.Q.

122. Hypnum (Pleurozium) Oakesii, Sulliv.—On stones and earth along a brook at the phosphate mines, Lievre River (May, 1885).

123. Hypnum (Hylocomium) triquetrum, Linn.—On earth and moss in woods.—Dow's swamp (October, 1884), also in woods at the phosphate mines, Lievre River (May, 1885)..

Abstract of Meteorological Statistics at Ottawa, June 1885 to May 1886, inclusive, by A. McGill, M.A.

	Months.												Year.
	1885.							1886.					
	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feby.	Mar.	Apr.	May	
Average height of barometer at 32° and reduced to sea level	29·888	29·897	29.934	29·998	30·000	29·918	29 959	30·057	30·047	29·925	30.117	29·860	29·967
Highest barometer	30·190	30·203	30.208	30·335	30 357	30·369	30 742	30·719	30·583	30·520	30·607	30·194	30·742
Lowest barometer	29·485	29·621	29.514	29·423	29·471	29·481	29·078	29·082	29·122	29·341	29·480	29 451	29·078
Monthly and annual ranges	0·705	0·582	0.694	0·912	0·886	0·888	1 664	1·637	1·461	1·179	1·127	0·740	1·664
	°	°	°	°	°	°	°	°	°	°	°	°	°
Average temperature of the air	63·05	69·37	62·39	54·93	43·87	32·84	17·49	10·51	10·55	24·44	45·10	55·93	40·87
Difference from average (10 years)	−3·05	−0·63	−4·6	−3 07	−4·13	+1·46	+0·99	−0·30	−1·45	+3·12	+7·30	−1·90	−0·52
Highest temperature	82·2	88·1	83·0	70·4	70·8	50·0	40·8	37·0	38·1	43·3	79·7	75·0	88·1
Lowest temperature	38·7	49·0	40·8	30·0	19·9	4·4	−10·6	−26·5	−22·5	−15·8	11·7	34·9	−26·5
Monthly range	43·5	39·1	42·2	49·4	50·9	45·6	51·4	63·5	60·6	59·1	68·0	40·1	1.4·6
Average maximum temperature	72·72	77·94	71·72	65·18	51·27	36·24	24·26	17·47	19·72	20·73	54·85	64·87	.....
" minimum temperature	50·23	57·55	59·72	42·61	35·17	26·60	7·85	2·28	1·97	14·92	32·01	44·89	.....
" daily range	22·49	20·39	21.00	22 57	16·10	9·64	16·41	15·19	17·75	15·81	22·84	19 98	18·32
Average pressure of vapour	0·426	0.592	0·481	0·378	0·256	0·176	0·098	0·077	0·084	0·114	0·243	0·306	0 269
Average humidity of the air	72	82	84	84	85	92	89	87	91	81	75	69	82
" temperature of the dew point	54·6	63.8	57·9	51·3	40·9	31·2	18·0	12·7	14·5	21·2	39·5	45·6	42·2
Amount of rain in inches	2 62	2·73	1·91	3·18	3·19	2·49	0·14	0·89	0·31	2 12	0·75	1·74	22·07
Difference from average (10 years)	+0·54	+0·83	+0·10	+0·37	+0 66	+1·24	−0·38	+0·26	−0·37	+1·13	−0·19	−1·05	+3 14
Number of days of rain	11	11	10	11	12	11	3	4	2	3	6	12	96
Amount of snow in inches	.....	.....	.....	.....	0·8	11·4	28 0	30·3	18·9	16·0	10·0	.....	115·3
Difference from average (10 years)	.....	.....	.....	.....	−1·2	+0·9	+0·1	+8·4	+0.5	−4·3	+6·3	−0·1	+10·6
Number of days of snow	.....	.....	.....	.....	1	8	10	13	14	10	3	.....	59
Percentage of sky clouded	45	51	55	38	61	80	69	64	57	61	45	45	56
Average velocity of wind	7·57	4·87	4·90	4·77	5·86	6·37	6·56	7·18	.....	6·77	5·01	5·55	.....

Auroras. No observations taken.